Draft
Environmental Impact Statement

Newmont Mining Corporation

Emigrant Project

U. S. Department of the Interior
Bureau of Land Management

Elko Field Office
Elko, Nevada

March 2005

MISSION STATEMENT

The Bureau of Land Management is responsible for the stewardship of our public lands. It is committed to manage, protect, and improve these lands in a manner to serve the needs of the American people for all times. Management is based upon the principles of multiple use and sustained yield of our nation's resources within a framework of environmental responsibility and scientific technology. These resources include recreation, rangelands, timber, minerals, watershed, fish and wildlife, wilderness, air and scenic, scientific and cultural values.

BLM/EL/PL-05/005+1793

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Elko Field Office
3900 East Idaho Street
Elko, Nevada 89801-4611
http://www.nv.blm.gov

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In Reply Refer To:
1793.8/3809(NV-010)
NVN 78123

Dear Reader:

Enclosed for your review and comment is the Draft Environmental Impact Statement (DEIS) for Newmont Mining Corporation's (Newmont's) proposed Emigrant Mine Project. In the DEIS we analyze the effects of developing and operating an open pit mine, constructing a waste rock disposal facility, run-of-mine heap leach pad, permanent stream diversion channel, ancillary support facilities, and reclaiming surface disturbances in the Emigrant Mine Project area. The Emigrant Mine Project is located approximately ten miles south of Carlin in Elko County, Nevada.

This DEIS addresses concerns identified by BLM or raised during a public scoping period from May 25 through July 7, 2004. Following the 60-day public review and comment period, a Final EIS will be prepared. The Final EIS will include monitoring and mitigation measures that address predicted direct, indirect, and cumulative impacts from Newmont's proposed mining and ore processing operation.

Public comments on the DEIS will be accepted during a 60-day comment period ending May 24, 2005. A public meeting to accept verbal and written comments is scheduled for April 26, 2005, from 3:00 P.M. until 6:00 P.M. at the BLM Elko Field Office. Comments on the DEIS should be submitted to:

Bureau of Land Management
Elko Field Office
Attention: Tom Schmidt
Emigrant Mine Project EIS Coordinator
3900 East Idaho Street
Elko, NV 89801

The Final EIS may be published in an abbreviated format so please retain this draft document for future reference. Your interest in the management of public land is appreciated. If you have any questions, please contact Tom Schmidt, Emigrant Mine Project EIS Coordinator at (775) 753-0200.

Sincerely yours,

Helen Hankins
HELEN HANKINS
Field Manager

DRAFT
ENVIRONMENTAL IMPACT STATEMENT
NEWMONT MINING CORPORATION
EMIGRANT PROJECT

LEAD AGENCY:	U.S. Department of the Interior Bureau of Land Management Elko Field Office Elko, Nevada
COOPERATING AGENCIES:	Nevada Department of Wildlife Nevada Division of Environmental Protection
PROJECT LOCATION:	Elko County, Nevada
COMMENTS ON THIS DRAFT EIS SHOULD BE DIRECTED TO:	Mr. Tom Schmidt EIS Project Coordinator Bureau of Land Management Elko Field Office 3900 East Idaho Street Elko, NV 89801
DATE DRAFT EIS FILED WITH USEPA:	March 25, 2005
DATE BY WHICH COMMENTS MUST BE POSTMARKED TO BLM:	May 24, 2005

ABSTRACT

This Draft Environmental Impact Statement (DEIS) analyzes potential impacts associated with Newmont Mining Corporation's (Newmont's) proposal to develop the Emigrant Project (Proposed Action), a proposed open pit gold mine located approximately 10 miles south of Carlin, Nevada. Newmont submitted a Plan of Operations for development of the Emigrant Project in February 2004. The Proposed Action provides for development and operation of an open pit mine; construction of a waste rock disposal facility, run-of-mine heap leach pad, permanent stream diversion channel, and ancillary support facilities; and reclamation of surface disturbances in the Emigrant Project Area. Approximately 1,463 acres would be disturbed by mine-related facilities, including 264 acres of private land and 1,199 acres of public land. The Emigrant Project would have a 14-year operational mine life and produce approximately 94 million tons of ore and 86 million tons of waste rock. Closure activities may continue for a period of up to 30 years after mining activity is completed. The Agency Preferred Alternative is the Proposed Action with mitigation.

Responsible Official for DEIS: **Helen Hankins**
Manager, Elko Field Office

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ENVIRONMENTAL IMPACT STATEMENT
EMIGRANT PROJECT

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SUMMARY

Newmont Mining Corporation (Newmont) proposes to develop and operate an open pit mine with associated surface support facilities at the Emigrant Project in Elko County, Nevada. The Project would result in development of an open pit mine, construction of a waste rock disposal facility and oxide heap leach facility, excavation of borrow material areas, construction of haul roads and ancillary facilities, and continued exploration activities. Development of the Emigrant Project is described in a Plan of Operations (Newmont 2004a) submitted in February 2004 to the Elko Field Office of the Bureau of Land Management (BLM). The Plan of Operations was revised in May 2004 (Newmont 2004b) and submitted to BLM. The Emigrant Project is located on public and private land in Elko County, Nevada approximately ten miles south of Carlin, Nevada.

This Environmental Impact Statement (EIS) describes Newmont's Proposed Action, No Action Alternative, and environmental consequences that could result from implementation of these actions. Potential direct, indirect, and cumulative effects on the environment are analyzed in this EIS. Impacts described herein will form the basis for a BLM decision regarding the Proposed Action, No Action Alternative, and selection of appropriate mitigation measures. No distinction is made in this EIS between potential impacts on public versus private land that would result from possible authorizations by BLM.

SUMMARY OF PROPOSED ACTION

Implementation of Newmont's Proposed Action would result in removal of ore and waste rock from multiple phases of an open pit mine. Approximately 86 million tons of waste rock would be removed to extract and leach 94 million tons of ore over a 14-year operational life. Development of the Emigrant Project would disturb approximately 1,199 acres of public land and 264 acres of private land.

The proposed open pit mine would be approximately 561 acres. Mining would progress in a series of phases beginning at lower elevations of the southern mine pit area. A waste rock disposal facility would be necessary during the first phases of mine development. The waste rock disposal facility would cover an area of 107 acres extending 150 feet above existing topography with a capacity of 15 million tons. Waste rock from subsequent phases would be placed in mined-out portions of the pit.

Low-grade oxide ore would be placed on a heap leach facility constructed south of the mine pit. The heap leach would be a run-of-mine facility so that crushing of ore would not be necessary at this time. If in the future, crushing becomes necessary, Newmont would obtain necessary permits from the Nevada Division of Environmental Protection (NDEP). Dewatering would not be necessary because the mine pit would be excavated above the groundwater table.

Ore and waste rock would be drilled and blasted in sequential benches to facilitate loading and hauling. Blasted ore and waste rock would be loaded into off-road, end-dump haul trucks using shovels and front-end loaders. Benches would be established at approximately 20-foot vertical intervals with bench widths varying to include safety berms and haul roads. Haul trucks would move within the pit using roads on the surface of benches with ramps extending between two or more benches.

Two tributary drainages have perennial flow immediately west of the proposed mine area. These two channels combine to form a single channel at the west side of the proposed mine pit. Below the confluence of these channels, flow is ephemeral and intermittent in response to spring snow-melt and major rain storms. A permanent diversion channel for this drainage would be constructed during the first two phases of mining across the southern part of the proposed mine pit area.

PHASE I MINING

Mining would begin at the south end of the deposit above the existing streambed elevation and extend eastward to establish a highwall. The next sequence would involve mining down to the streambed and constructing the diversion channel to the east of the existing streambed. Flow would continue in the existing channel until this section of the diversion is completed. Once the new diversion channel is established, flow would be diverted into the new channel, which would allow mining to progress below the level of the original streambed. Waste rock generated during this phase of mine development would be placed in the waste rock disposal facility.

PHASE II MINING

This phase of mine development would be similar to Phase I, but would occur on the north or upper section of the drainage. Excavation would progress eastward above the existing elevation of the streambed allowing flow to remain in the existing channel. Portions of waste rock generated during this phase would be placed in the waste rock disposal facility and some used as backfill in mined-out portions of the Phase I sequence. Upon completion, surface flow would be redirected into the diversion channel and mining below the streambed would occur. The permanent diversion channel would be completed at the end of Phase II mining sequence. The new diversion channel would be constructed at the same grade as the original streambed (3%) and would be located entirely in Devils Gate limestone.

PHASE III THROUGH PHASE VIII MINING

Once Phase I and Phase II mining are complete, and the permanent diversion channel established, mining would proceed from lower elevations of the deposit toward higher elevations. A portion of waste rock generated during Phase III of mining would be placed in the waste rock disposal facility. Subsequent waste rock generated through Phase VIII would be placed as backfill within mined-out portions of the pit.

ANCILLARY FACILITIES

Existing support facilities at the Rain Mine would be used over the life of the Emigrant Project. A new service/access road would be constructed from the Emigrant Project to provide mine traffic access to support facilities.

RECLAMATION

Reclamation activities would include regrading the waste rock disposal facility and heap leach pad, removing structures after cessation of operations, regrading disturbed areas (including roads), drainage control, removing and regrading stockpile areas, replacing salvaged growth media, revegetation, and reclamation and diversion control monitoring. The reclamation schedule would encompass the period between cessation of mining through revegetation. Reclamation would take place concurrent with operations, where possible.

PROJECT ALTERNATIVES

Primary issues identified during review and scoping of the Emigrant Project include: 1)

permanent relocation of a drainage that would be impacted by mine development; and 2) potential for mined rock to become acidic and release trace metals to the environment. Newmont has committed to construct a permanent diversion channel that would convey surface water across the reclaimed mine pit area. This diversion channel has been designed to function as a permanent channel replacing a natural stream segment lost to mining activity.

Similarly, Newmont has submitted geochemistry information on the various rock units that would be excavated during development of the Emigrant Project. This information demonstrates that a small portion of overall rock volume to be excavated would be potentially acid generating (PAG). Additional kinetic testing will be conducted by Newmont to confirm the acid-base accounting data previously compiled. The PAG rock would be blended with acid neutralizing oxide waste and placed on an acid neutralizing rock formation (Devils Gate limestone) in mined-out portions of the pit. PAG material would be encapsulated with acid neutralizing oxide waste rock to effectively isolate the PAG rock from atmospheric oxygen and water.

No other component of the Proposed Action was determined to have potentially adverse impacts requiring an alternative to eliminate or reduce impacts. Therefore, the only alternative discussed in detail in this EIS is the No Action Alternative. Minor issues and potential impacts identified in Chapter 4, *Consequences of Proposed Action and No Action Alternative*, are addressed with specific mitigation measures.

NO ACTION ALTERNATIVE

Under the No Action Alternative, the Proposed Action would not be approved. Newmont would not be authorized to develop the defined ore reserves, construct ancillary mine facilities, place waste rock in the disposal facility, or construct the oxide heap leach facility on public land. Potential impacts predicted to result from development of the Project would not occur.

ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

This section describes alternatives to the Proposed Action that were eliminated from further review in the EIS. These alternatives were identified during the public scoping process or by BLM during review and analysis of the Proposed Action. These alternatives were considered technically infeasible, unreasonable, provided no advantage over the Proposed Action, or would not meet the purpose and need of the Proposed Action.

USE EXISTING HEAP LEACH FACILITY AT RAIN MINE

This alternative would include all components of the Proposed Action but would require Newmont to haul ore approximately 2.5 miles from the Emigrant Project to the existing heap leach facility at the Rain Mine. This alternative could eliminate the need to construct the proposed leach facility at the Emigrant Project site.

Rationale for Dismissal

The Rain Mine heap leach facility is no longer active and drain-down of process solution is ongoing. The existing heap leach facility at the Rain Mine encompasses approximately 40 acres and expansion of this facility to accommodate up to 100 million tons of ore from the Emigrant Project would require an additional 320 acres of leach area. Expansion of the existing heap leach facility to accommodate proposed ore production from the Emigrant Project would be required. Such an expansion at the Rain Mine was determined to not have an advantage over the Proposed Action.

CONSTRUCT NEW OFFICE AND MAINTENANCE SHOP COMPLEX AT EMIGRANT PROJECT SITE AND COMPLETE ROAD UPGRADE

Implementation of this alternative would include construction of all components of the Proposed Action but would require Newmont to construct a new Office and Maintenance Shop Complex near the northwest corner of the proposed heap leach facility in the SW¼, Section 2, Township 31 North, Range 53 East. This alternative would also require upgrading the existing two-track road to accommodate haul truck traffic.

Rationale for Dismissal

This alternative was dismissed from further analysis because it would require approximately 22 acres of new surface disturbance compared to the Proposed Action and would not provide any environmental advantage over the Proposed Action.

REGRADE BACKFILLED AREAS TO ELIMINATE TERRACES

This alternative would include implementation of all components of the Proposed Action and would require regrading of backfilled mine panels to eliminate flat terraced surfaces associated with the backfill operation.

Rationale for Dismissal

This alternative was eliminated from further analysis because regrading backfilled areas to eliminate flat surfaces would increase the erosional energy of the backfilled areas which could increase the amount of soil loss from the regraded areas. The terraced configuration of the backfilled areas would provide flat areas that would effectively collect and trap soil that erodes from intervening slopes between terrace areas.

AGENCY PREFERRED ALTERNATIVE

The agency preferred alternative is the Proposed Action with mitigation.

SUMMARY OF IMPACTS

Analysis of potential impacts and mitigations associated with Newmont's proposed Emigrant Project is presented in Chapter 4, *Consequences of Proposed Action and No Action Alternative.* The following is a summary of potential impacts, by resource, resulting from the Proposed Action and No Action Alternative.

PROPOSED ACTION

GEOLOGY, MINERALS, AND PALEONTOLOGY

Direct impacts to the geologic resource associated with implementation of the Proposed Action include relocation of approximately 86 million tons of waste rock and 94 million tons of ore. No known fossil quarries or vertebrate fossils are located in the area to be physically disturbed by the Proposed Action and therefore would result in no identified impacts to paleontological resources.

Excavation and exposure of waste rock and ore associated with the Proposed Action to oxygen and precipitation could result in formation of acidic water. Acidic water contact with minerals in the waste rock and ore could result in release of trace elements into groundwater and surface water at concentrations above background levels. Static geochemical acid-base accounting test results indicate that 1.1 percent of waste rock and 2.5 percent ore (Chainman and Fresh Webb siltstone) generated under the Proposed Action would be potentially acid generating (PAG). The Devils Gate limestone (32% of waste rock and 21% of ore) presents no risk of acid generation. The majority of rock

to be excavated from the mine area (67% or waste rock and 76% of ore) would be oxide Webb siltstone that has an unlikely potential to generate acid.

Results of Net Carbonate Value (NCV) testing show that approximately 88 percent of waste rock and 85 percent of ore are in one of the basic NCV categories (slightly basic, basic, or highly basic). In addition, approximately 11 percent of waste rock and 12 percent of ore are in the neutral or inert NCV category. NCV testing does not measure the reactivity of rock material. To confirm the NCV results, Newmont is conducting additional kinetic testing, primarily using the oxidized Webb siltstone component of waste rock and ore. Kinetic testing will verify NCV data and allow corrections for any false positive data. Based on geology of the deposit, approximately 20 kinetic tests will be performed by an independent laboratory.

Potential for release of trace elements from the three operational waste rock types was assessed using MWMP data collected from seven composite samples. For comparison purposes, drinking water standards for arsenic and antimony were exceeded in MWMP extract from five samples that represent all waste rock types (carbon sulfur, oxide carbonate, and oxide siliceous) and a run-of-mine composite. Arsenic and antimony can be mobile under alkaline conditions; however, migration of these compounds is limited due to sorption by clays, hydroxides, and organic matter. Concentrations of other metals in six of the seven waste rock samples were low and often below the laboratory detection limits. One carbon sulfur composite sample tested in 1995 produced an extract with concentrations of cadmium, lead, manganese, nickel, selenium, thallium, and zinc that also exceed drinking water standards. Each MWMP sample produced leachate with pH values ranging from 6.4 to 8.2 standard units.

Newmont would use rock blending, isolation, encapsulation, and backfilling methods to minimize acid generation and leachate migration from PAG waste rock. PAG rock would be placed in mined-out portions of the open pit on top of and blended with Devils Gate limestone.

The waste rock disposal facility would be regraded and revegetated, thus minimizing infiltration and production of leachate. These measures are expected to adequately mitigate potential impacts of waste rock disposal under the Proposed Action with appropriate operational monitoring and verification programs.

AIR QUALITY

Mining-related activities at the Emigrant Project would be a source of particulate and gaseous air pollutants. Fugitive dust emissions would be generated by mining, processing, hauling, stockpiling ore, and disposal of waste rock. Particulate emissions would be mitigated by minimization of drop heights during loading, dust suppression and procedures outlined in the Handbook of Best Management Practices (Nevada State Conservation Commission 1994). Gaseous pollutant emissions would result from blasting, construction and mining equipment, and vehicle exhaust. These emissions would be minimized by proper equipment maintenance and operation. Newmont would seek any required air quality construction and operating permits from NDEP, Bureau of Air Quality. Air quality in the vicinity of the Emigrant Project would continue to be better than National Ambient Air Quality Standards. Emigrant Project emissions would not affect air quality or visibility in any Class I areas.

WATER QUANTITY AND QUALITY

The Proposed Action would have direct impacts on some water resources in the Project Area.

Impacts to surface water would be associated primarily with diversion and replacement of a natural intermittent stream channel with an engineered diversion channel through the mine pit area. Areas to be disturbed by mine-related activities (e.g., roads, mine pit, waste rock disposal area, and heap leach facility) would result in increased erosion and sedimentation until reclaimed vegetation has been sufficiently established. Best Management Practices (BMPs) would be implemented for disturbed areas to prevent or minimize sediment movement to off-site areas. A monitoring program would be implemented to verify on-site control of erosion and sedimentation. If on-site increases in sediment load to surface water did occur from the Emigrant Project, these increases would extend to Dixie Creek and possibly South Fork Humboldt River.

Short-term impacts to groundwater levels would result due to removal of water by production wells in the central part of Dixie Creek Valley. These wells would transport water from the valley bottom to the proposed mine facilities located farther upland on the west side of Dixie Creek Valley This groundwater pumping, however, has been occurring since 1988 for the nearby Rain Mine. Groundwater withdrawal from the production wells for the first five years of the proposed Emigrant Project (135 to 140 million gallons per year) would be similar to full water production for the Rain Mine (138 million gallons per year peak production).

Another potential impact could involve release of trace elements into groundwater or surface water at concentrations above water quality standards from the backfilled mine pit and/or waste rock disposal facility. Acid-base account tests of these rock types indicate that a small percentage of waste rock (1.1%) and ore (2.5%), all of which is the carbon sulfur type (Chainman and Fresh Webb siltstone), would be potentially acid generating (PAG). Approximately 67 percent of waste rock and 76 percent of ore (Webb siltstone) show an unlikely potential to generate acid. The remaining amount of waste rock (32%) and ore (21%), as Devils Gate limestone, presents no risk of acid generation.

Results of Net Carbonate Value (NCV) analyses show that Devils Gate limestone is highly basic, Chainman and Fresh Webb siltstone are slightly acidic to acidic, and oxide Webb siltstone is slightly basic. Approximately 88 percent of waste rock and 85 percent of ore are in a basic NCV category (slightly basic, basic, or highly basic). Approximately 11 percent of waste rock and 12 percent of ore are in the neutral or inert NCV category.

Meteoric Water Mobility Procedure (MWMP) tests indicate that waste rock has potential to leach some trace elements in concentrations exceeding drinking water quality standards (antimony, arsenic, cadmium, lead, manganese, nickel, selenium, thallium, and zinc). With the exception of arsenic and antimony, these exceedances of water quality standards occurred in a single carbon sulfur composite sample analyzed in 1995. Carbon sulfur rock (Chainman *and Fresh Webb siltstone) would be managed as PAG waste.*

Newmont proposes to use rock blending, isolation, encapsulation, and backfilling methods to minimize acid generation and leachate migration from waste rock that is potentially acid-generating. The heap leach facility would be designed to collect drain-down water in a lined pond, which would eventually be filled with soil and vegetated to evapotranspirate all water in the long-term. The backfilled mine pit, waste rock disposal facility, and heap leach facility would be graded and vegetated, thereby minimizing meteoric water infiltration and production of leachate. These measures are expected to adequately mitigate potential impacts of waste rock and leach rock disposal under the Proposed Action, along with appropriate operational monitoring and verification programs.

SOIL RESOURCES

The proposed Emigrant Project would result in approximately 1,463 acres of surface disturbance including the mine pit area, haul roads, waste rock disposal facility, heap leach pad, process ponds, borrow areas, access roads, and continued exploration activities. Potential impacts to soil resources include loss of soil during salvage and replacement, soil loss in stockpiles due to wind and water erosion, and reduced biological activity and soil structure. These impacts would be reduced by direct hauling stripped growth media from active mine pits for placement over backfilled portions of previously mined areas. Newmont would initiate reclamation activities concurrent with ongoing mining operations. As mining operations progress, backfilled portions of the pit would be concurrently regraded, topsoiled, and seeded.

The last mine pit panel would not be backfilled and would remain with exposed rock faces at the end of mining. Interruption of soil processes and functions during operation of the proposed mine Project would be reversed by returning soil to disturbed areas through reclamation and allowing natural soil development to become reinstated.

VEGETATION

Implementing the Proposed Action would result in disturbance to plant communities, consisting of 11 vegetation types. Reclamation would occur on disturbed areas after mining activities cease. However, approximately 98 acres of the Phase VIII mine pit would not be reclaimed with vegetation. Establishment of big sagebrush communities on reclaimed areas may take decades, and would require special reclamation measures that favor sagebrush over grasses and other herbaceous species.

SPECIAL-STATUS PLANT SPECIES

The Proposed Action would not affect special-status plant species. No special-status plants are known to be present in the Project Area.

WETLANDS/RIPARIAN AREAS

The Proposed Action would result in removing or filling approximately 0.15 acre of wetlands and 0.88 acre of non-wetland waters of the U.S. associated with the mine pit, heap leach facility, borrow area, and sediment basin dams. Wetland mitigation and enhancement would compensate for lost or degraded wetland functions and values that would result from the Proposed Action. The diversion channel that would be constructed through the mine pit area may support wetlands and riparian vegetation if sediment in the engineered channel accumulates to sufficient depth. Riparian areas adjacent to proposed mine facilities would be fenced to protect against livestock grazing and trampling.

FISHERIES AND AQUATIC RESOURCES

Approximately 0.15 acre of aquatic habitat along a natural intermittent stream channel would be removed by the proposed mine pit, which would eliminate a small population of Lahontan speckled dace, Lahontan redside shiner, and aquatic macroinvertebrates. The new diversion channel that would be constructed in the mine pit area may allow for some fish passage depending on flow velocities; however, this channel probably would not support resident fish populations. The channel, constructed primarily in bedrock, would likely not support wetland and riparian vegetation to the degree necessary to support resident fish populations. Sediment control basins constructed in the drainage channel would preclude fish from migrating through the Project Area during life-of-mine operations. Once reclamation is completed and sediment control basins have been removed

fish could migrate through the area, depending on flow conditions in the engineered channel.

WILDLIFE RESOURCES

Direct impacts to wildlife resulting from the Proposed Action would be loss of habitat and the subsequent displacement or loss of wildlife. Direct loss of wildlife habitat would eliminate cover (nesting, hiding, and thermal), breeding sites, and forage. Most of the affected habitat within the Study Area consists of sagebrush/ bunchgrass communities. Construction of new haul roads, ancillary facilities, and mine development would result in 1,463 acres of habitat loss, most of which is dominated by sagebrush. Reclamation of disturbed lands would eventually restore habitat for some species; however, species dependent on plant communities with a large component of big sagebrush, and trees would experience a net loss in habitat quality as a result of the Proposed Action.

SPECIAL-STATUS WILDLIFE SPECIES

The threatened bald eagle and Lahontan cutthroat trout would not be affected by the Proposed Action. Removal of upland and wetland vegetation would reduce bat foraging opportunities until reclamation is successful. Bat roosting habitat (cliffs, rock crevices, and juniper trees) in the mine pit area would be removed. Habitat for Preble's shrew, pygmy rabbit, and burrowing owl may be affected by the Proposed Action; however, these species have not been confirmed to occur in the Study Area. Foraging habitat for Swainson's and ferruginous hawks would be reduced; however, no nests would be affected. Brooding, wintering, and foraging habitat for sage grouse would be reduced through loss of unreclaimed habitat (mine pit and water diversions) and reduced quality of post-mining habitat (reduced sagebrush density). Increased sediment could adversely affect white-faced ibis and California floater in South Fork Humboldt River, if sediment levels increase in these surface water systems as a result of the Proposed Action.

RECREATION

The Emigrant Project would result in 3,687 fewer acres available for recreational activities during operation and after cessation of mining until reclamation is complete. The Project would bisect the Tonka Creek road precluding continuous or "loop" travel through the area during active mining operations. Upon completion of mining the road segment would be reconstructed and relocated to connect with the existing route and re-establish "loop" travel through the area. Most of the work force for facility construction and mining would be drawn from the local labor pool; consequently, impacts to existing campgrounds and other area recreational opportunities are expected to be minimal relative to existing conditions.

GRAZING MANAGEMENT

Implementation of the Emigrant Project would result in the loss of 285 Animal Unit Months (AUMs) in Emigrant Springs Allotment No. 5417. There would be no reduction of AUMs in Tonka Allotment No 5468. Carrying capacity of the allotment would be reduced until reclamation of disturbed areas is complete and vegetation established. Alternative water sources would be developed to compensate for losses incurred from mining activity.

ACCESS AND LAND USE

The Emigrant Project would bisect the Tonka Creek road precluding continuous or "loop" travel through the area during active mining operations. Upon completion of mining the road segment would be reconstructed and relocated to connect with the existing route and re-establish "loop" travel through the area. Numerous two-track roads provide access throughout the area to support livestock grazing

operations and public access for recreational purposes.

NOISE

Noise generated by the Proposed Action would vary during construction, mining, and reclamation activities. Although no residences are located within a 5-mile radius of the Project, the area is rural and home to numerous wildlife species, therefore, the EPA L_{dn} 55 dBA criteria (EPA 1979) was used to evaluate Project noise levels.

Short-term noise levels during construction and reclamation activities are predicted to be L_{dn} 55 dBA at 0.25 miles from the Project Area, which meets the EPA guideline of L_{dn} 55 dBA. Short-term noise levels during construction and reclamation activities are not predicted to be above L_{dn} 55 dBA beyond a 0.25-mile radius.

Long-term noise levels during the mining operations, including work at the open pit, waste rock disposal and heap leaching facilities, is predicted to be L_{dn} 56 dBA at 0.5 miles and L_{dn} 50 dBA at 1 mile from the Project Area. The EPA L_{dn} 55 dBA guideline is predicted to be met at approximately 0.6 miles beyond the Project Area, and the long-term noise during mining activities is not predicted to exceed this level beyond a 0.6-mile radius.

VISUAL RESOURCES

Visual impacts of the Proposed Action and Alternatives were analyzed using procedures set forth in the Visual Resource Contrast Rating Handbook (BLM 1986). Terraced, flat-topped waste rock piles and rock faces would present moderate to strong contrasts with the existing landform and line of steep canyons and gentle slopes. The moderate to strong form contrasts would impact visual resources in a localized manner. Views of the majority of mining activities would be hidden from view by canyon walls and higher ridge land forms to the south and east. The color and texture of the reclaimed area would be a moderate contrast to the existing landscape. Reclamation of disturbed areas would meet Class IV VRM objectives.

CULTURAL RESOURCES

Forty-three cultural resources are located within the Area of Potential Effect (APE). Of these, three prehistoric period resources (CrNV-01-13259, -13261, and -13272) have been determined eligible to the National Register based on Criterion D. These sites are located within the proposed oxide heap leach facility and would be impacted during construction of that facility. If avoidance is not possible, impacts to the three properties could be determined to have "no adverse effect" if a data recovery plan is prepared, approved by BLM in consultation with the Nevada State Historic Preservation Office, and subsequently implemented.

NATIVE AMERICAN CONCERNS

Implementation of the Proposed Action would have no direct or indirect impacts on Western Shoshone traditional cultural values, practices, properties, or human remains.

SOCIAL AND ECONOMIC RESOURCES

The Emigrant Project would employ approximately 180 people. Most of the work force for the Project would be from existing mine-related work forces in the Carlin Trend. The initial construction work force for the Emigrant Project would be approximately 100 people decreasing to about five employees at the end of construction. Construction and development are expected to require approximately 12 months.

The Proposed Action would create positive impacts through continued employment in the mining industry and indirect employment in the retail and service sectors. Property and net proceeds of mining taxes paid by Newmont for the Emigrant Project collected by local and state jurisdictions would also continue. Negative impacts would be minimal because employees from existing and nearby facilities likely would be used for construction and operation of the facility, thereby extending their work rather than bringing in new workers.

ENVIRONMENTAL JUSTICE

There would be no disproportionate impacts to minority or low-income populations resulting from implementation of the Proposed Action and Alternatives.

CHAPTER 1

INTRODUCTION

The Elko Field Office of the United States Department of the Interior (USDI) Bureau of Land Management (BLM) received a Plan of Operations from Newmont Mining Corporation (Newmont) in February 2004, revised in May 2004, proposing development and operation of an open pit mine and associated support facilities in the Emigrant Project (Project) Area. The Project is located on public and private land in Elko County, Nevada, approximately ten miles south of Carlin, Nevada (**Figures 1-1** and **1-2**).

Proposed facilities in the Project Area would be located in part on public land administered by BLM; consequently, review and approval of Newmont's Plan of Operations is required by BLM pursuant to Title 43, Code of Federal Regulations, Part 3809 (43 CFR 3809) Surface Management Regulations. Due to the potential for the proposed Project to result in significant environmental impacts, BLM determined that an Environmental Impact Statement (EIS) would be necessary, as required by the National Environmental Policy Act of 1969 (NEPA).

BLM is serving as lead agency in preparing this EIS for the proposed Project with the following cooperating agencies:

- Nevada Division of Environmental Protection (NDEP); and
- Nevada Department of Wildlife (NDOW).

This document follows regulations promulgated by the Council on Environmental Quality (CEQ) for implementing procedural provisions of NEPA (40 CFR 1500-1508) and BLM's NEPA Handbook (H-1790-1).

This EIS describes components and environmental consequences of proposed mining and waste rock disposal operations at the proposed Emigrant Project. Chapter 1 describes the purpose of and need for action, the role of BLM, and public participation in the EIS process. Chapter 2 provides a historical perspective of gold mining in the Emigrant Project and Carlin Trend areas, a description of mineral exploration operations, and a description of the Proposed Action and alternatives. Chapter 3 describes the existing environment in the Emigrant Project Area. Chapter 4 details potential direct, indirect, and cumulative effects associated with the Proposed Action and No Action alternative, and mitigation measures that may be selected to reduce or minimize impacts. Chapter 5 identifies the consultation and coordination with public, state, and federal agencies that occurred during preparation of this EIS and a list of preparers. Chapter 6 contains a list of references cited in developing the EIS.

PURPOSE OF AND NEED FOR ACTION

The purpose of Newmont's proposal is to use their existing mining work force to conduct open pit mining on unpatented mining claims and fee land within the Project Area to produce gold from ore reserves. The need for the proposed Project is to produce gold, which is an established commodity with international markets and demand. Uses include jewelry, investments, standard for monetary systems, electronics, and other industrial applications.

AUTHORIZING ACTIONS

A proposal submitted to BLM may be approved only after an environmental analysis is completed as required by NEPA. BLM decision options include approving Newmont's Plan of Operations for the Emigrant Project as submitted, approve an alternative(s) to the Plan of Operations to mitigate environmental impacts, approve the Plan of Operations with stipulations to mitigate environmental impacts, or deny the Plan of Operations. If BLM denies the Plan of Operations, the applicant can modify and resubmit the Plan of Operations to address issues or concerns identified by BLM on the original Plan of Operations.

A portion of Newmont's proposed Emigrant Project facilities would be located on public land administered by BLM; such operations must comply with BLM regulations for mining on public land (43 CFR 3809, Surface Management Regulations); the Mining and Mineral Policy Act of 1970; and the Federal Land Policy and Management Act of 1976. These laws recognize the statutory right of mining claim holders to develop federal mineral resources under the General Mining Law of 1872. These laws, however, in combination with other BLM policies (i.e., the Resource Management Plan) also require BLM to analyze proposed mining operations to ensure: 1) adequate provisions are included to prevent undue or unnecessary degradation of public land, 2) measures are included to provide reasonable reclamation of disturbed areas, and 3) proposed operations would comply with other applicable federal, state, and local statutes and regulations.

Newmont is proposing to conduct geochemical kinetic testing to confirm analysis performed on waste rock and ore from the proposed Emigrant Project Area. These data will be reviewed by BLM and NDEP prior to issuance of the Record of Decision.

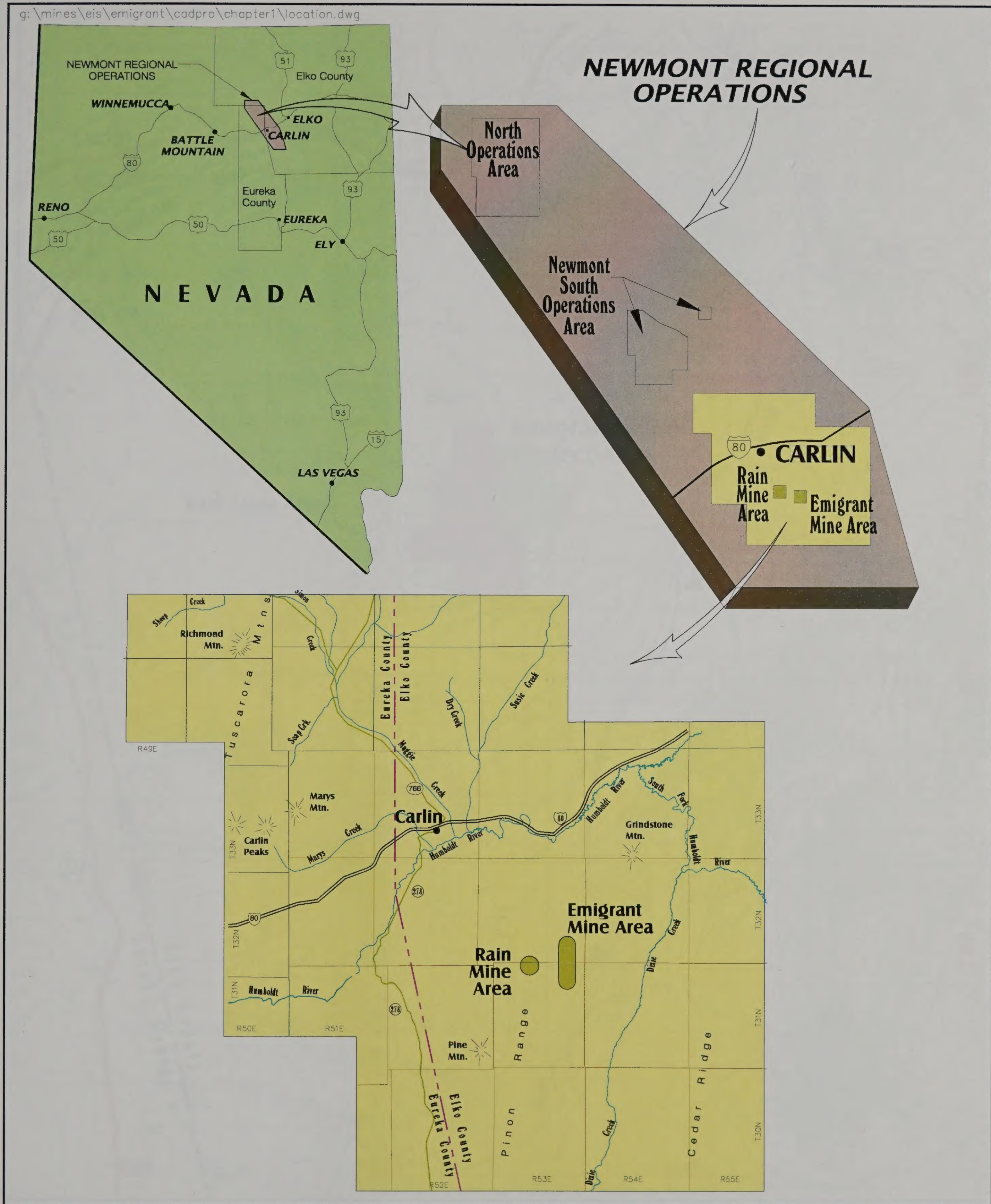
In addition to BLM, other federal, state, and local agencies have jurisdiction over certain aspects of the Proposed Action. **Table 1-1** provides a listing of agencies and their respective permit/authorizing responsibilities. In addition to securing authorization from BLM, the primary permits to be obtained by Newmont include a reclamation permit, water pollution control permit, industrial artificial pond permit, air quality operating permit, and a stormwater discharge permit.

The Nevada Division of Environmental Protection (NDEP) bonding requirements for mine reclamation in Nevada are outlined in Nevada Administrative Code (NAC)/Nevada Revised Statute (NRS) 519A Regulations. For BLM, Surface Management Regulations (43 CFR 3809) establishes bonding policy relating to mining and mineral development. In 2002, BLM and NDEP updated an existing Memorandum of Understanding (MOU) to coordinate evaluation and approval of reclamation plans, and to determine bond amounts for mining and exploration operations. The MOU allows submittal of one bond by an operator to satisfy reclamation bond requirements for both agencies.

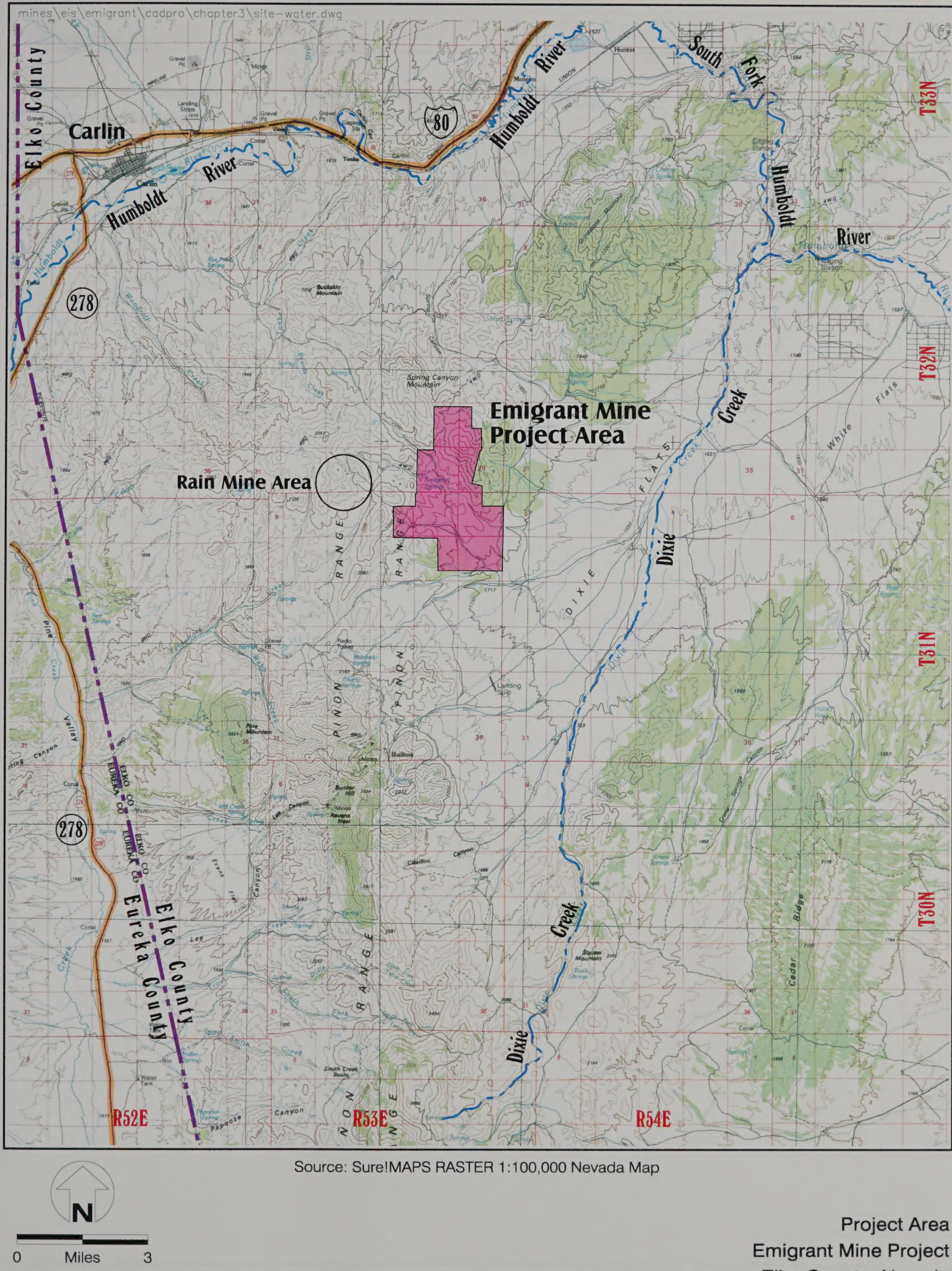
Operators must submit a reclamation cost estimate when submitting a Plan of Operations to BLM. The reclamation cost estimate must be calculated as if third party contractors would perform reclamation after the site has been vacated by the operator. The bond amount must be sufficient to cover 100 percent of the cost of reclaiming the proposed disturbance.

RELATIONSHIP TO BLM POLICIES, PLANS, AND PROGRAMS

The Emigrant Project Plan of Operations has been reviewed for compliance with BLM policies, plans, and programs. The proposal is in conformance with the minerals decisions in the



General Location Map
Emigrant Mine Project
Elko County, Nevada
FIGURE 1-1



Project Area
Emigrant Mine Project
Elko County, Nevada
FIGURE 1-2

Record of Decision, Elko Resource Area, Resource Management Plan, approved in March 1987.

ISSUES

Public and agency comments concerning the Proposed Action are shown in **Table 1-2**. This table also provides references to the sections of this EIS in which responses to each issue raised in the comments are provided.

TABLE I-I Regulatory Responsibilities	
Authorizing Action	**Regulatory Agency**
Plan of Operations/Rights of Way	Bureau of Land Management (BLM)
National Environmental Policy Act	BLM
National Historic Preservation Act	BLM; Nevada Division of Historic Preservation & Archaeology
Native American Graves Protection & Repatriation Act	BLM
American Indian Religious Freedom Act	BLM
Clean Water Act (Section 404)	United States Army Corps of Engineers (USCOE)
High Explosive License/Permit	United States Bureau of Alcohol, Tobacco, & Firearms
Hydrocarbon Permit	Nevada Division of Environmental Protection (NDEP). Bureau of Mining Regulation and Reclamation
Stormwater Permit	NDEP, Bureau of Water Pollution Control
Air Quality Permit	NDEP, Bureau of Air Pollution Control
Water Pollution Control Permit	NDEP, Bureau of Mining Regulation & Reclamation
Industrial Artificial Pond Permit	Nevada Department of Wildlife (NDOW)
Mine Reclamation Permit/Bonding	NDEP, Bureau of Mining Regulation & Reclamation/BLM
Solid Waste Disposal Permit	NDEP, Bureau of Waste Management
Potable Water	Nevada Division of Health (NDH), Department of Human Resources
Sewer System Approvals	NDH, NDEP, Bureau of Water Pollution Control
Safety Plan	Mine Safety & Health Administration (MSHA)
Water Rights	Nevada Division of Water Resources
Water Appropriation Permit	Nevada State Engineer
Endangered Species Act of 1973	United States Fish & Wildlife Service (USFWS)
Cactus Removal Permit	Nevada Division of Forestry

TABLE 1-2
Scoping Summary
Proposed Emigrant Project

Issue	Response
Mining and Reclamation	
Discuss proposed topsoil salvage efforts in the EIS.	Chapter 2 – Proposed Action Chapter 4 – Soil Resources
Describe reclamation plans with regard to erosion control and proposed post mine vegetation communities in the EIS.	Chapter 2 – Proposed Action
Reclamation seed mixes should include species that will provide forage and cover attributes similar to pre-mine condition.	Chapter 2 – Proposed Action
Backfill mine pits to blend with surrounding topography.	Chapter 2 – Proposed Action
Discuss proposed seedbed preparation activities in the EIS.	Chapter 2 – Proposed Action
Describe post mine topography of backfilled material in pits and establishment of vegetation with regard to livestock and wildlife habitat in the EIS	Chapter 2 – Proposed Action
The operation should be properly bonded.	Chapter 1– Introduction
The EIS must follow U.S. mining law and BLM is mandated to follow the Mining and Minerals Policy Act of 1970.	Chapter 1 – Introduction
Discuss potential for acid generation from waste rock.	Chapter 3 – Geology, Minerals and Paleontology Chapter 4 – Geology, Minerals and Paleontology
Water Quantity and Quality	
Describe impacts to livestock and wildlife water sources and mitigation measures.	Chapter 4 – Water Quantity and Quality
Describe impacts to Emigrant Spring, Cherry Spring, and springs and water sources on west side of Corfett Mountain Range and Upper Scott Ranch and mitigation measures.	Chapter 4 – Water Quantity and Quality
Stock water developments have to be installed and operating before any rangeland is closed for mining to mitigate for stock water losses.	Chapter 4 – Water Quantity and Quality
Existing water rights permits should be examined to ensure the Emigrant operation is encompassed within the existing permitted place of use and the diversion points are appropriately located.	Chapter 3 – Water Quantity and Quality
Notification of the Nevada Division of Water Resources must be done in the case of installation of any new water management or storage structures.	Chapter 4 – Water Quantity and Quality
Wildlife and Vegetation	
Effect of Project on wetland and riparian habitat in general and Emigrant Springs area in particular should be evaluated in the EIS	Chapter 4 – Fisheries and Aquatic Resources Chapter 4 – Water Quantity and Quality
Potential impacts from the Emigrant Project on destruction or alteration of breeding, nesting, cover, and foraging habitat for bats and non-game birds should be described.	Chapter 4 – Wildlife Resources Chapter 4 – Special Status Wildlife Species
Potential impacts resulting from mine development to raptor nest sites, migration routes, winter and summer range for deer and antelope, roosting habitat for bats, and sage grouse habitat including leks, and other sensitive habitat should be evaluated in the EIS.	Chapter 4 – Wildlife Resources Chapter 4 – Special Status Wildlife Species
Occurrence of Lahontan cutthroat trout in Dixie Creek above the Project Area should be evaluated in the EIS.	Chapter 4 – Fisheries and Aquatic Resources
All land clearing activities should occur outside of the avian breeding season to protect nests.	Chapter 4 – Wildlife Resources Chapter 4 – Special Status Wildlife Species
Impacts to federally listed species and species of concern should be evaluated.	Chapter 4 – Special Status Wildlife Species
Land Use and Access	
Describe fencing, gates, and cattleguard types, materials, and maintenance responsibility and mitigation plans to deal with reduced public access, livestock crossing, recreational access from the Carlin side of Project, and grazing access as a result of closing roads in Project Area.	Chapter 2 – Proposed Action Chapter 4 – Land Use and Access

TABLE 1-2 (continued) Scoping Summary Proposed Emigrant Project	
Issue	**Response**
Fences should enclose only the minimum area required for operations, expanding as necessary as the footprint increases, minimizing impact to grazing land.	Chapter 2 – Proposed Action
Discuss potential mitigation of livestock forage losses by improvement of forage in areas not impacted by mine development.	Chapter 4 – Land Use and Access
Social and Economic Resources	
Alternatives should have economic impacts quantified so that public can evaluate potential economic effects of each on the community.	Chapter 4 – Social and Economic Resources
Discuss mitigation of economic losses to ranchers for livestock forage reduction due to mine development.	Chapter 4 – Social and Economic Resources
South Fork Band Environmental Department Issues*	
Will pit intersect groundwater?	Chapter 3 – Water Quantity and Quality
Is diversion channel sufficient size to accommodate a 24-hour/ 100- year storm event?	Chapter 2 – Proposed Action (Diversion Channel)
Will operator be required to follow all laws and regulations?	Chapter 1 - Introduction
Will waste rock be tested to determine if it will mobilize contaminants?	Chapter 3 – Geology, Minerals and Paleontology Chapter 4 – Geology, Minerals and Paleontology
What parameters are used to measure success of reclamation?	Chapter 2 – Proposed Action
Waste rock and ore need to be characterized by meteoric water mobility tests and acid base accounting for potential to generate acid and mobilize metals.	Chapter 3 – Geology, Minerals and Paleontology Chapter 4 – Geology, Minerals and Paleontology
Cultural artifacts must be protected under Archaeological Resources Protection Act (16 USC 1701), Native American Graves Protection and Repatriation Act, section (3)(d)(1).	Chapter 1 – Introduction Chapter 4 – Cultural Resources Chapter 4 – Native American Concerns

* These comments were received by BLM staff from the South Fork Band Environmental Department during Native American coordination and communication efforts.

CHAPTER 2
DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

INTRODUCTION

This chapter describes Newmont's previous operations in the Emigrant Project Area, Newmont's Proposed Action to develop the Project, and reasonable alternatives to the Proposed Action. The proposal to develop ore reserves located in the Emigrant Project Area is collectively referred to as the Emigrant Project or the Proposed Action in this document.

Alternatives considered in the EIS are based on issues identified by BLM and comments received during the public scoping process. Alternatives analyzed in this document are intended to reduce or minimize potential impacts associated with the Proposed Action.

Detailed discussions of the following topics are presented in this chapter:

- History of mineral exploration and mining in the Carlin Trend and Emigrant Project Area.
- Newmont's previous activities in the Emigrant Project Area.
- Newmont's Proposed Action for the Emigrant Project.
- Alternatives to the Proposed Action, including the No Action Alternative.

MINING IN CARLIN TREND

Exploration activities in the Carlin Trend (**Figure 1-1**) began in the early 1870s with staking of the Good Hope claims in the Maggie Creek district (Coope 1991). These claims produced mainly lead and silver, with minor amounts of barite and gold. The first significant gold discovery was made on Lynn Creek in 1907, approximately 1.5 miles north of the present Carlin Mine. Placer gold discoveries followed in Sheep, Rodeo, and Simon creeks.

Although the area has been mined for the past 120 years, major mining activity began with development of the Carlin Pit in 1965. Newmont initiated its mining activities in the North Operations Area at the Blue Star mine in 1974 (Smith 1985). Newmont's North Operations Area includes all of Newmont's mining operations located between the Pete and Bootstrap mines. Mining at the Bootstrap open pit mine began in 1974 and continued until 1984; closure and reclamation activities were completed in 1988. In 1986, Newmont began mining the Blue Star/Genesis open pit mines within the Blue Star Operations Area. In 1988, Newmont constructed and initiated operations at the Mill #4 process facilities and North Area Leach Facilities. In 1994, Newmont re-initiated mining at the Bootstrap open pit mine, developing the Capstone and Tara ore bodies.

Newmont discovered gold at the South Operations Area property in 1979 and began open pit mining the Maggie Creek deposit in 1980. In 1985, the first year of operation at Gold Quarry pit, gold production was

approximately 106,000 ounces. Since 1985, production in the South Operations Area has expanded periodically due to the ability to process refractory resources.

Development at the southern end of the Carlin Trend began in the early 1980s. The Rain claims were acquired by Newmont in 1979 and exploration drilling between 1982 and 1984 defined the Rain reserves and discovered other deposits in the subdistrict: Emigrant, Gnome, Snow Peak, and Southern Mineralized Zone (SMZ). From 1992 to 1997, exploration in the subdistrict lead to discovery of the Rain Extension, Tess, NW Tess, and Saddle deposits. At the same time, additional drilling along the Emigrant Fault extended the envelope of known mineralization. Open pit mining at Rain began in October 1987 and the first gold bar was poured June 1988. Open pit mining continued through 1994. Underground mining began at Rain in 1994 and continued through 1998. The Rain Mine is currently initiating closure activities with cessation of mining and finalization of leach operations.

GOLD MINERALIZATION

The following primary geologic occurrences have led to present-day gold mining in the Carlin Trend: 1) deposition and lithification of marine sediment that host gold mineralization; 2) faulting that disrupted these rocks and created pathways for movement of mineralizing fluid and openings for deposition of gold; 3) deposition of gold from mineralizing fluid associated with igneous activity; and 4) surface erosion that exposed the mineralized rocks.

As gold-bearing fluid migrated upward along faults and fractures, it permeated the disrupted rocks throughout the area. This resulted in widespread dissemination of gold particles and sulfide minerals through large volumes of rock, creating large-tonnage, low-grade gold deposits known to geologists as "Carlin-type" ore bodies. Disseminated gold deposits are typically composed of submicron-sized gold particles often visible only with a scanning electron microscope. Over 20 ore deposits have been identified in the Carlin Trend since exploration for disseminated gold was initiated.

Geologic and mineralization processes have resulted in formation of two disseminated ore types in the Carlin Trend. The uppermost or near-surface ore type is known as oxide ore. This type of ore occurs at shallow depths where oxygenated water percolating through the subsurface has leached sulfide minerals from the rock. The natural leaching process leaves gold in the rock but removes sulfidic minerals.

A second ore type is unoxidized and typically occurs at greater depths at or below the water table where water is low in oxygen. Unoxidized ore is commonly rich in sulfides and can be refractory (i.e., difficult to treat for recovery of precious metals). Refractory ore is not readily amenable to gold extraction through conventional cyanide leaching; additional processing is required to recover the gold. Only oxidized ore is present at the proposed Emigrant Mine.

ORE PROCESSING IN CARLIN TREND

Development of heap leaching for gold recovery from low-grade oxide ore began in the 1970s, allowing further expansion of the regional mining industry. Heap leaching involves placing low-grade oxide ore on heaps and application of a weak cyanide solution to the ore. The cyanide solution percolates through the heaps, dissolving gold from the ore. The heaps are underlain with a synthetic and soil liner system designed to collect and channel gold-bearing solution to holding ponds. Gold is removed from the cyanide solution by adsorption to carbon. The carbon is then processed to remove the gold, which is shipped to specialty smelters for further refinement.

PREVIOUS AND CURRENT OPERATIONS

Open pit and underground mining, waste rock disposal, ore processing (Mill #3), tailing impoundment, and a heap leach facility are located at the Rain Mine area approximately 2.5 miles west of the proposed Emigrant Project. Mining activity has ceased at the Rain Mine while heap leach processing and reclamation continues. Exploration activities are ongoing in the Emigrant Project Area.

In 1983, Newmont began exploration in the Rain and Emigrant Project Areas at the southern end of the Carlin Trend approximately ten miles south of Carlin. Beginning in 1988, Newmont conducted mining and processing operations at the Rain Mine Project. The Rain Mine operation consisted of an open pit mine, waste rock disposal facility, mill, tailing storage facility, and a heap leach pad. Approximately 10 million tons of ore were extracted to produce 886,779 ounces of gold over a 10-year period. Mining operations are currently inactive while heap leach activities continue at the Rain Mine.

Exploration activities at the Emigrant Project Area were authorized under the Decision Letter for the Emigrant Springs Exploration Plan of Operations (BLS-1 N16-93-001P) issued in December 1994. In 1996, Newmont submitted an amendment to the Rain Plan of Operations (N16-86-007P) outlining activities proposed for the Emigrant Project, located 2.5 miles east of the Rain Mine.

Mining at Emigrant requires a diversion channel to divert an intermittent stream channel that transects the proposed mine pit area. The 1996 Plan of Operations for the diversion channel was to temporarily locate the channel on a pit bench during initial phases of mining. Waste rock generated from successive mining phases would be used to re-establish the channel at its original location on the west side of the proposed pit area. This diversion channel would be lined with a bentonite-impregnated fabric overlain by bedding material and rip-rap. Once construction of the channel at its original location was complete, the temporary diversion channel would be reclaimed.

The design included in the February 2004 Plan of Operation was to accommodate flow for twice the 100-year/24-hour storm event (500 cubic feet per second). It was also designed at the same general gradient as the existing channel (3%). During review of this original design, concerns of locating the channel on waste rock were raised, as well as the desire to design the channel with sinuosity similar to the original channel.

Alternate locations and design modifications were subsequently evaluated. As a result, the current proposed design would locate the diversion channel in the center portion of the proposed mine pit on bedrock of Devils Gate limestone.

Simons & Associates were retained to produce a detailed design of the proposed diversion channel (Simons and Associates 2004). Simon and Associates also performed a hydrologic analysis of the diversion channel to ensure the diversion channel was sized adequately for various return periods. As a result, the proposed diversion channel is designed to transmit a peak flow from a 500-year storm event (707 cfs) with a factor of safety of 1.3.

In 1997, BLM compiled an administrative draft Environmental Assessment (EA) in response to Newmont's proposed Emigrant Project amendment for the Rain Mine. During the interim, ongoing exploration activities in the Project Area identified greater ore reserves, which subsequently required re-evaluation of the proposed mine development. The EA addressing the Emigrant Project amendment to the Rain Mine was never published nor was a Record of Decision ever signed. In February 2004 (revised May 2004), Newmont submitted a separate Plan of Operations for the Emigrant Project, which is analyzed in this document.

PROPOSED ACTION

In February 2004, Newmont (2004a) submitted a Plan of Operations (Plan) for the Project to BLM. The Plan of Operations for the Project was revised in May 2004 (Newmont 2004b) and includes descriptions of the following proposed activities:

- Developing and operating an open pit mine;
- Constructing a waste rock disposal facility;
- Sequential storing of oxide and potentially acid-generating (PAG) waste rock in mined-out areas of the pit;
- Developing an oxide heap leach facility;
- Constructing a diversion channel for an intermittent stream through the mine pit area;
- Developing borrow areas;
- Modifying existing power and water rights-of-way to allow relocation around the heap leach facility;
- Constructing ancillary mine facilities;
- Reclaiming areas disturbed by mining activities; and
- Continuing exploration activities.

LOCATION AND LAND OWNERSHIP

The Emigrant Project is located on the eastern slopes of the Piñon Range in the Dixie Creek Basin, and includes Sections 25, 26, 33, 34, 35, and 36, Township 32 North, Range 53 East, M.D.M. and Sections 1, 2, 3, 4, 11, and 12, Township 31 North, Range 53 East, M.D.M. Surface and mineral ownership are shown on **Figure 2-1**.

The proposed permit boundary would encompass 3,687 acres of which 2,656 are public surface and 1,031 are private surface. The proposed mine disturbance boundary (within the permit boundary) shown on **Figure 2-2** includes buffer zones around proposed surface disturbances. Total area of proposed surface disturbance within the proposed mine permit boundary would be approximately 1,463 acres, which includes 1,199 acres of public land and 264 acres of private land. Approximately 126 acres in the existing Rain Mine complex would be used to support the Emigrant Project. Proposed disturbance areas and mine components are shown on **Figure 2-2** and summarized in **Table 2-1**.

TABLE 2-1
Proposed Surface Disturbance Areas
Emigrant Project

Facility	Existing (acres)			Proposed (acres)			Total (acres)		
	Public	Private	Total	Public	Private	Total	Public	Private	Total
Pits	0	0	0	561	0	561	561	0	561
Haul/Access Roads[1]	77	3	80	155	9	164	232	12	244
Heap Leach Facility	0	0	0	249	121	370	249	121	370
Waste rock Disposal Facility	1	0	1	40	66	106	41	66	107
Ancillary Areas[2]	1	0	1	90	40	130	91	40	131
Subtotal	**79**	**3**	**82**	**1,095**	**236**	**1,331**	**1,174**	**239**	**1,413**
Exploration									
Proposed[3]	0	0	0	25	25	50	25	25	50
Total Disturbance	**79**	**3**	**82**	**1,120**	**261**	**1,381**	**1,199**	**264**	**1,463**

Source: Newmont 2005a.

[1] Includes 69 acres of exploration roads within proposed mine boundary and 7 acres of existing right-of-way between Borrow Area # 2 and proposed heap leach facility.
[2] Includes topsoil stockpiles and borrow areas.
[3] Includes proposed exploration disturbance outside the proposed mine disturbance boundary but within the proposed permit boundary.

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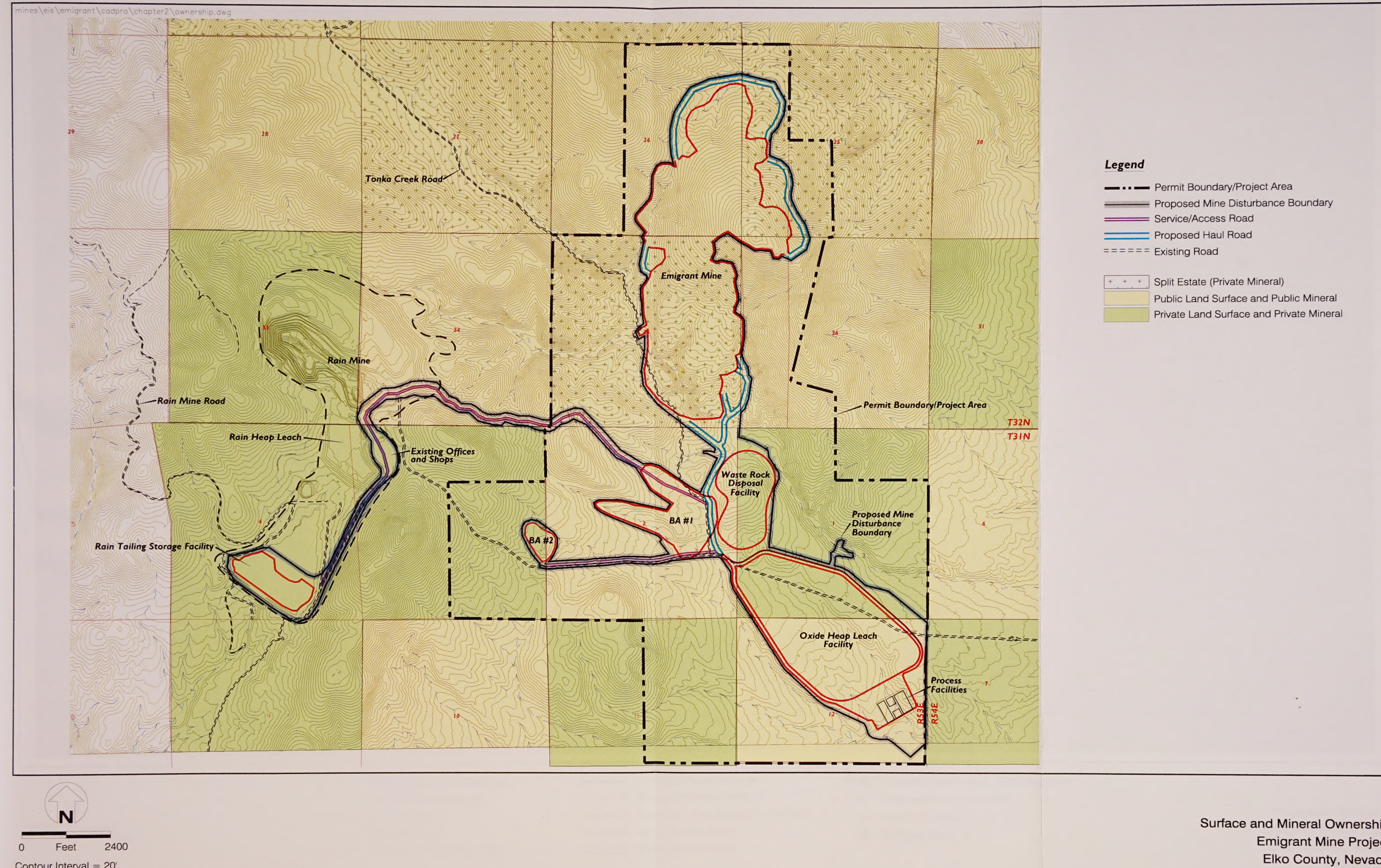
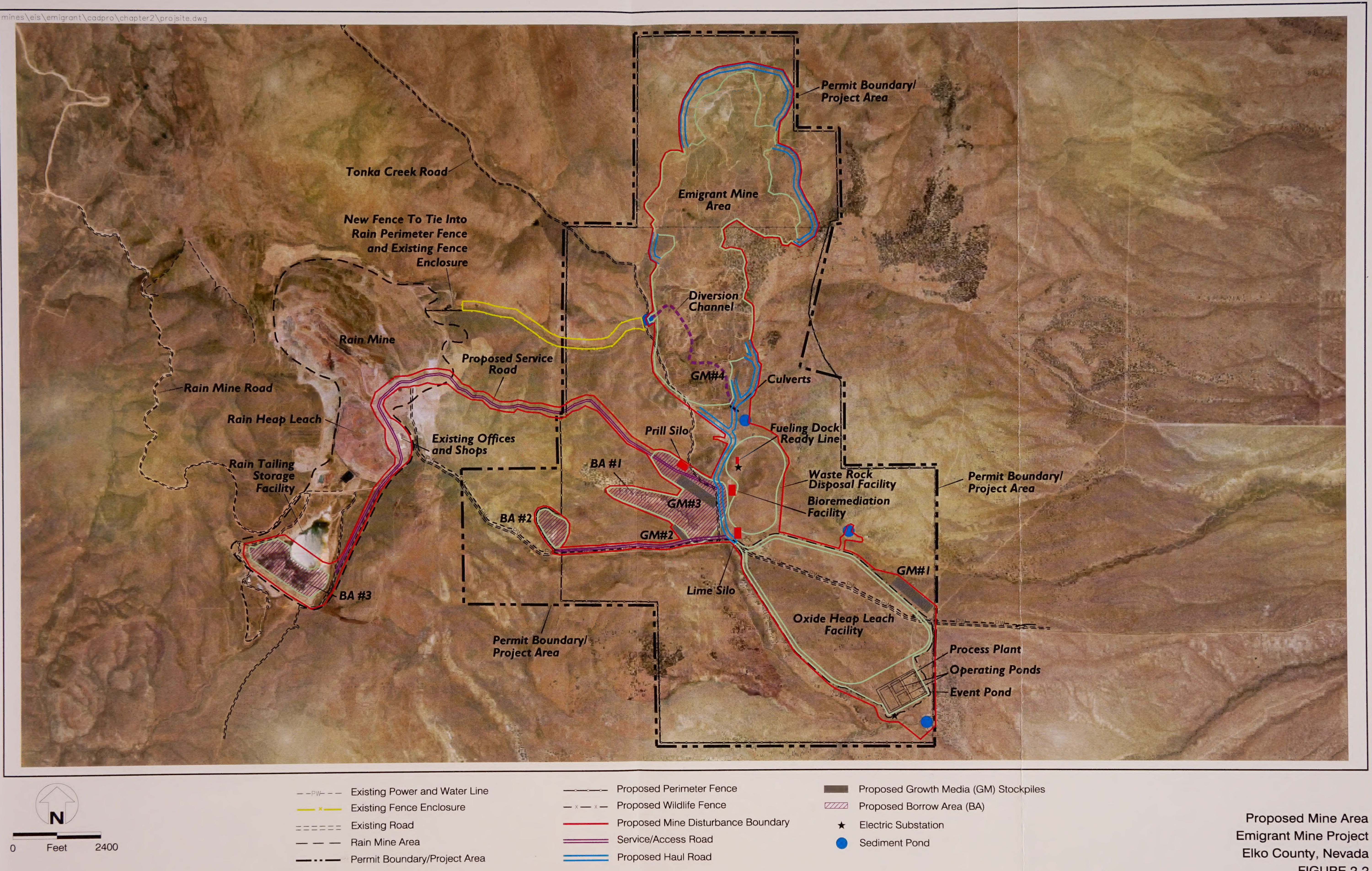


Surface and Mineral Ownership
Emigrant Mine Project
Elko County, Nevada
FIGURE 2-1



Proposed Mine Area
Emigrant Mine Project
Elko County, Nevada
FIGURE 2-2

Geologic evaluations on public land, including exploration access roads, drill pads, and trenches in the vicinity of the Emigrant Project were reviewed under the Environmental Assessment and Record of Decision issued for the Modification of the Emigrant Springs Exploration Plan of Operations No. BLM/EK/PL-2003/018. The Emigrant Project would encompass 50 additional acres of proposed disturbance associated with exploration activity.

These components of Newmont's Plan of Operations for the Emigrant Project constitute the Proposed Action analyzed in this EIS. The Proposed Action referred to throughout the EIS is Newmont's Plan of Operations (including revisions) for the Emigrant Project.

LIFE-OF-MINE SCHEDULE

Under current operating plans and projections, Newmont anticipates the Emigrant Project to have an operational mine life of 14 years. Reclamation, closure, and monitoring activities could extend up to 30 years. The proposed timeline schedule for the Emigrant Project is shown in **Table 2-2**.

MINING OPERATIONS

Newmont proposes to remove ore and waste rock from an open pit mine at the Emigrant Project Area. Low-grade oxide ore would be placed on a heap leach facility constructed south of the open pit mine. Metered amounts of lime are added to the ore enroute to the heap leach facility. The heap leach would be a run-of-mine facility so that crushing ore would not be necessary at this time. Dewatering of the mine would not be necessary, as the open pit would not extend below the groundwater table. Mining is projected to occur over a 10-year period.

The proposed open pit would disturb approximately 561 acres of public land. Mining would progress in phases, beginning at the lower elevation at the southern end of the pit. A waste rock disposal facility would be constructed during the first phases of mine development. The waste rock disposal facility would disturb approximately 107 acres and extend about 150 feet above existing topography with a capacity of 15 million tons. Waste rock from subsequent phases would be placed as backfill in mined out portions of the pit.

TABLE 2-2
Emigrant Project Schedule

Activity	Estimated Time Frame
Permitting	2005
Construction (Phase I Pad)	2006
Mining	2006 thru 2016
Heap Irrigation	2006 thru 2020
Construction (Phase II Pad) (continued Heap Irrigation)	2007 thru 2020
Construction (Phase III Pad) (continued Heap Irrigation)	2010 thru 2020
Phased Capping of Heap	2021 thru 2024
Solution Evaporation	2021 thru 2024
Closure Monitoring (From 5 years up to 30 years)	2025 thru 2055

Source: Newmont 2005b.

Ore and waste rock would be drilled and blasted in sequential benches to facilitate loading and hauling. Blasted ore and waste rock would be loaded into end-dump haul trucks using shovels and front-end loaders. Benches would be established at approximately 20-foot would be loaded into end-dump haul trucks using shovels and front-end loaders. Benches would be established at approximately 20-foot vertical intervals with bench widths varying to include safety berms and haul roads. Haul trucks would move within the pit using roads on the surface of benches with ramps extending between two or more benches.

Drill cuttings would be collected during blasthole drilling and analyzed to determine gold content and metallurgical and waste rock characteristics. The blasted rock material would then be loaded into haul trucks for transportation to the waste rock disposal facility, placed as backfill into mined out pits, or the heap leach facility.

A standard BLM fence would be constructed around the permit boundary to prevent livestock from entering active mine areas. The northern extension of the fence would be advanced to coincide with mining operations so as to allow continued livestock grazing longer in that area. Once the mine is fully developed the fence would enclose the entire permit area and remain in place until reclamation is complete.

EMIGRANT OPEN PIT MINE

Prior to commencing mining operations, Newmont would perform several functions including:

- Construct access route;
- Expand and upgrade offices and maintenance shop at the Rain Mine;
- Reroute power and water lines around proposed heap leach facility;
- Erect perimeter fence to preclude livestock entry to active mine areas;
- Construct ancillary facilities (e.g., powder magazine, prill and lime silos);
- Construct Phase I heap leach facility; and
- Install stormwater run-off control ditches, and sediment ponds.

Where possible, land clearing and surface disturbance would be timed to prevent destruction of active bird nests or young birds during the avian breeding season (May 1 to July 15, annually) to comply with the Migratory Bird Treaty Act (MBTA). If surface disturbing activities are unavoidable, Newmont would have a qualified biologist survey areas proposed for immediate disturbance for the presence of active nests. If active nests are located, or if other evidence of nesting is observed (mating pairs, territorial defense, carrying nesting material, transporting of food), the area would be avoided to prevent destruction or disturbance of nests until the birds are no longer present. Avian surveys would be conducted only during the breeding season and immediately prior to Newmont's activities that result in disturbance. After such surveys are performed, and disturbance created (i.e., road construction and drill pad development), Newmont would not disturb additional land during the avian breeding season without first conducting another avian survey. After July 15, new land clearing activities would continue, and no further avian surveys, in compliance with MBTA, would be conducted until the following year.

The Emigrant deposit is a large, shallow, low-grade oxide ore body situated along the side of a hill. Geologic investigations have identified mineralization extending 12,000 feet along a north-south trend, and 3,000 feet east of the Emigrant Fault. The deposit extends from the

bottom to the top of the hill, which would facilitate mining in phases up the hillside allowing waste rock to be placed into previously mined out portions of the pit.

One small drainage flows intermittently through the proposed mine pit area. A new channel for this drainage would be constructed during the first two phases of mining to form a permanent diversion through the mine pit area.

Phase I Mining

Mining would begin at the south end of the deposit above the existing streambed elevation and extend eastward and establish a highwall. The next sequence would involve mining down to the streambed and constructing a diversion channel to the east of the existing streambed. Flow would continue in the existing channel until this section of the diversion is completed **(Figure 2-3).** Once the new channel is established, flow would be diverted into the channel, which would allow mining to progress below the level of the original streambed. Waste rock generated during this phase of mine development would be placed in the waste rock disposal facility.

Phase II Mining

This phase of mine development would be similar to Phase I but would occur on the north or upper section of the drainage. Excavation would progress eastward above the existing elevation of the streambed allowing flow to remain in the existing channel. A portion of waste rock generated during this phase would be placed in the waste rock disposal facility and some used as backfill in mined out portions of the Phase I sequence. Upon completion of the diversion channel, surface flow would be redirected into the channel and mining below the streambed would occur. The permanent diversion channel would be completed at the end of Phase II mining sequence. The new diversion channel would be constructed at the same grade as the original streambed (3%) and would be located entirely in Devils Gate limestone. Detailed information on construction and design of the diversion channel can be found in the *Diversion Channel* section of this chapter.

Phase III through Phase VIII Mining

Once Phase I and Phase II mining are completed, and the permanent diversion channel is established, mining would proceed from the lower elevations of the deposit toward the higher elevations. Phase II through Phase VIII mining sequences are depicted in **Figures 2-4 and 2-5.**

WASTE ROCK DISPOSAL FACILITY

Development of the Emigrant Project would require construction of an external (outside the pit limit) waste rock disposal facility to be located in portions of Sections 1 and 2, Township 31 North, Range 53 East (**Figure 2-3**). A portion of the waste rock generated during the first three phases of mining would be placed in the waste rock disposal facility. Subsequent waste rock generated during Phases IV through VIII would be placed as backfill within mined out portions of the pit. The waste rock disposal facility would be engineered for stability and designed, where practicable, with boundaries to blend with surrounding topography. The proposed waste rock disposal facility would disturb approximately 107 acres (41 public and 66 private) with a capacity up to 15 million tons.

Waste rock would be placed by end-dumping down an advancing face in successive horizontal lifts of 20 to 60 feet, depending on topography. The waste rock disposal facility would be constructed to an overall height of 150 feet above ground surface to an operating slope of 1.4H:1.0V and reclaimed at an overall average slope of 3.0H:1.0V.

A truck ready line and equipment fueling area would be constructed on the first lift of the waste rock disposal facility. A 30,000-gallon above-ground storage tank with 110 percent containment would be located in the truck ready line area. Design specifications for the equipment fueling facility may change pending NDEP review. Facilities at the Rain Mine would be used until construction of the truck ready line is complete.

Based on regional seismicity, a magnitude 7.0 earthquake was used for design of the waste rock disposal facility. Since epicenters are not closely associated with identified faults in this region, the epicenter of a maximum credible earthquake could occur anywhere within the area (Ryall 1977). Consistent with standard and accepted design practices, the value of 0.13 gravity (g) is taken as two-thirds of the maximum horizontal ground acceleration of 0.2g expected to occur as a result of the design seismic event of 7.0 on the Richter scale. Newmont has designed the waste rock disposal facility with a horizontal coefficient of acceleration of 0.13g used to simulate earthquake loading for a pseudostatic case.

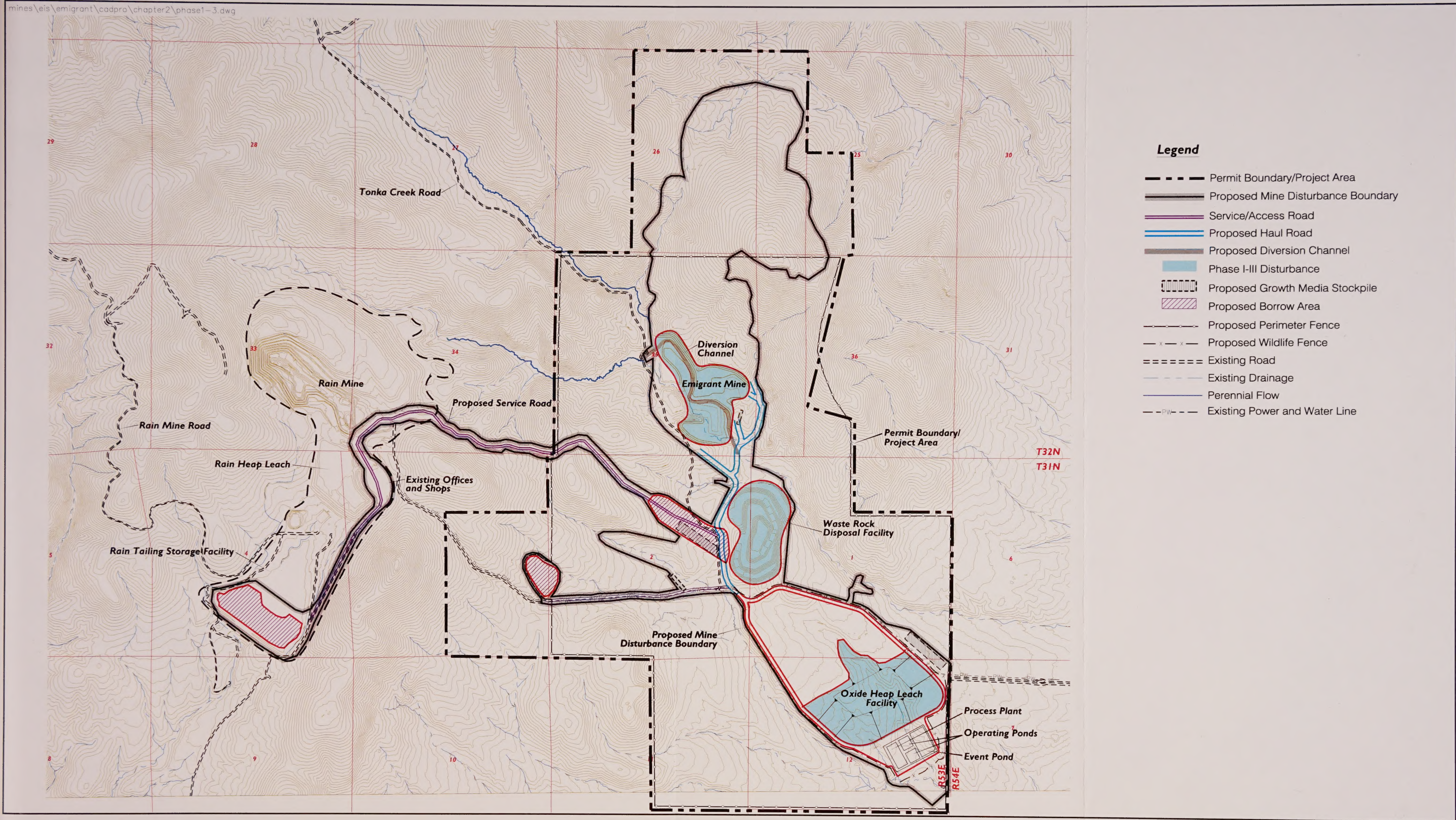
WASTE ROCK AND ORE CHARACTERIZATION

Approximately 86 million tons of waste rock and 94 million tons of ore would be removed from the Emigrant Project Area under the Proposed Action. Waste rock would consist primarily of Devils Gate limestone (oxide carbonate), Webb siltstone (oxide siliceous), unoxidized Fresh Webb siltstone (carbon sulfur refractory), and Chainman siltstone (carbon sulfur refractory). Most of the rock to be removed from the mine pit would be Webb siltstone (67% of waste rock and 76% of ore) and Devils Gate limestone (32% of waste rock and 21% of ore). The Chainman siltstone and Fresh Webb siltstone account for only 1.1 percent of waste rock and 2.5 percent of ore.

To characterize potential for acid generation from the waste rock and ore, Newmont (2004b) collected 1,470 rock samples from four exploration drilling campaigns (1993, 1994, 2002, and 2002). The 1993 and 1994 campaigns focused on a small pit boundary in the southern portion of the Emigrant deposit. Subsequent drilling in 2001 and 2002 included holes across the entire deposit and expanded the proposed pit to the north. Approximately 200 of these samples were outside of the proposed mine pit boundaries and are not included in the following results discussion. Waste rock is represented by 1,100 samples, and ore is represented by 172 samples. Each of the waste rock and ore samples was subjected to laboratory analysis of carbon fractions (total, organic, and carbonate carbon) and sulfur fractions (total, sulfate, and sulfide sulfur). From these results, the following values were calculated: Neutralization Potential (NP); Acidification Potential (AP); Net Carbonate Value (NCV); and Net Neutralization Potential (NNP).

The BLM (1996) uses NP:AP ratios and NNP values to evaluate potential for rock to generate acid. Rock is assumed to be Potentially Acid Generating (PAG) if NP:AP $\leq$1.0 and NNP $\leq$20 tons $CaCO_3$ per kiloton (tons/kton) rock material. Rock will not be considered PAG if NP:AP $\geq$3.0 and NNP $\geq$20 tons/kton. For samples having NP:AP between 1.0 and 3.0, or NNP between -20 and +20 tons/kton, the rock has an unlikely potential to generate acid.

In addition to NP:AP and NNP-based BLM guidance, Newmont considers NCV data for evaluation of potential for rock to generate acid using criteria obtained from the document, "*Newmont Standard Waste Rock Evaluation Methods – Protocol for NCV Classification Studies*". These criteria were developed to address rock samples having little or no acidification and neutralization potential. Such samples have NCV values that suggest an unlikely potential to generate acid.



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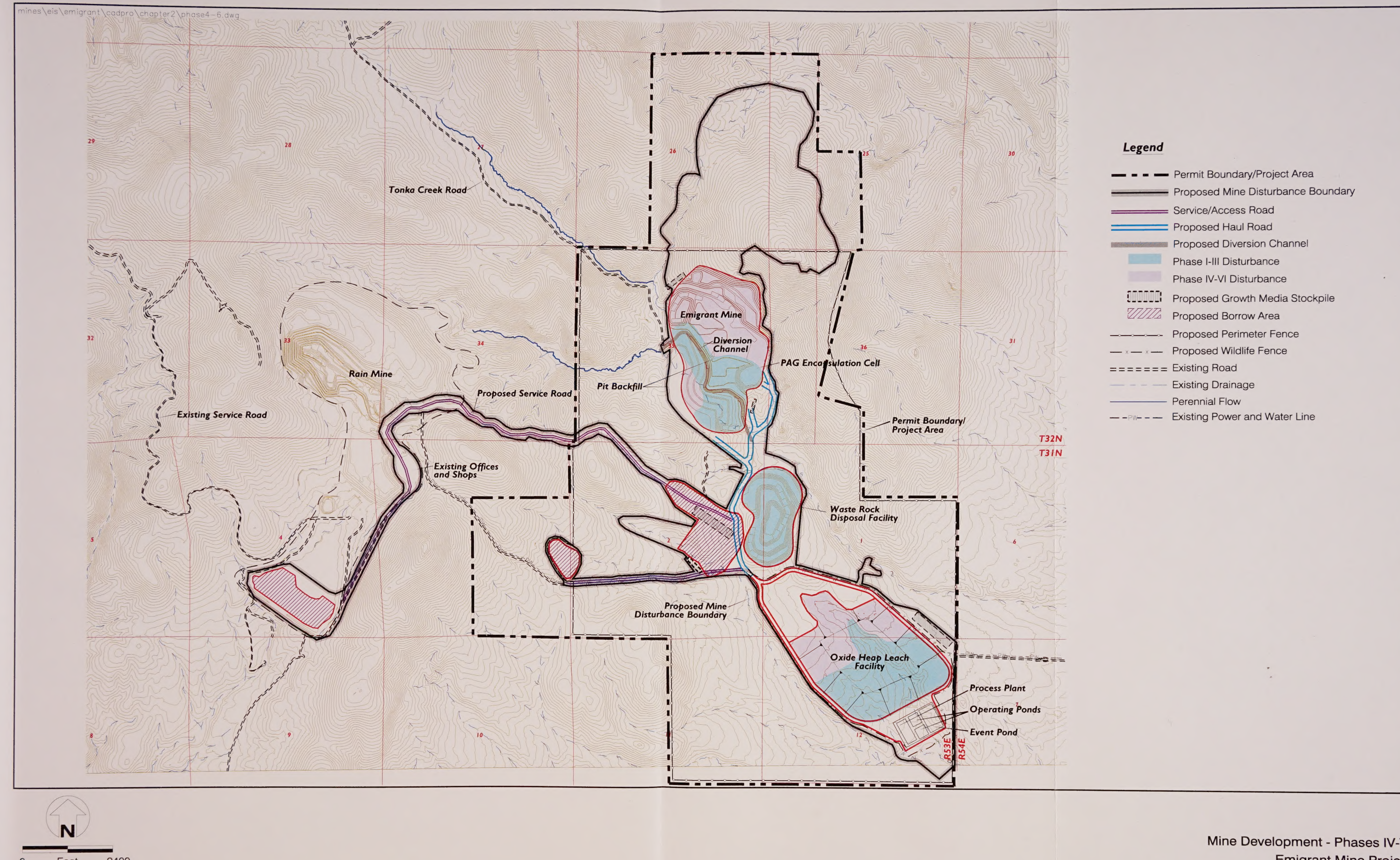
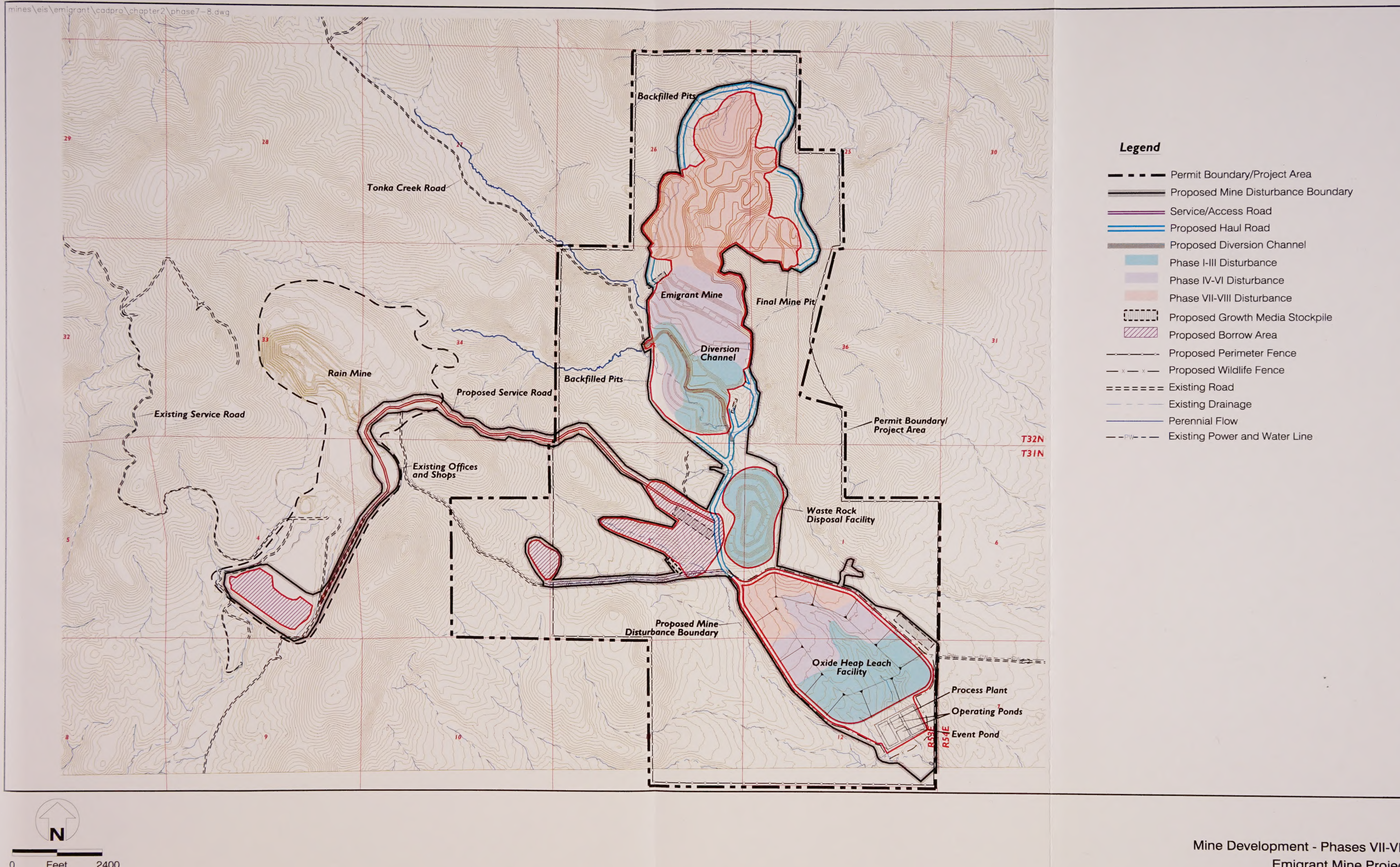
Mine Development - Phases I-III
Emigrant Mine Project
Elko County, Nevada
FIGURE 2-3



Mine Development - Phases IV-VI
Emigrant Mine Project
Elko County, Nevada
FIGURE 2-4



Mine Development - Phases VII-VIII
Emigrant Mine Project
Elko County, Nevada
FIGURE 2-5

Results of NCV analyses show that Devils Gate limestone is highly basic (NCV = 21 for waste rock and 16 for ore), Chainman and Fresh Webb siltstone are slightly acidic to acidic (NCV = -1.2 for waste rock and -0.8 for ore), and oxide Webb siltstone is slightly basic (NCV = 0.1 for both waste rock and ore). Approximately 88 percent of waste rock and 85 percent of ore are in one of the basic NCV categories (slightly basic, basic, or highly basic). In addition, approximately 11 percent of waste rock and 12 percent of ore are in the neutral or inert NCV category.

NCV testing does not measure reactivity of the rock material. Therefore, to confirm NCV results, Newmont will conduct additional kinetic testing, primarily using the oxidized Webb siltstone component of waste rock and ore. Kinetic testing will verify NCV data and allow corrections for any false positive data. Rock samples for kinetic tests will be collected using an NCV grid that includes tonnages of each NCV classification for the proposed mine pit area. This sampling grid will be used to ensure adequate spatial representation of rock types that would be encountered over the life-of-mine. Based on geology of the deposit, approximately 20 kinetic tests will be performed by an independent laboratory. Newmont will provide the data for BLM and NDEP to complete their analysis prior to issuance of the Record of Decision.

WASTE ROCK HANDLING

Newmont would sample, test, and classify waste rock in accordance with NDEP *Waste Rock Overburden Evaluation Guidelines* to determine acid generating potential of mined waste rock. Acid-base accounting data from blast hole assays would be submitted annually to BLM and NDEP.

Characterization of waste rock and proper routing for disposal are determined through evaluation of NCV data for blast-hole samples. NCV is a measure of acid generating or neutralizing potential of waste rock, based on sulfide and carbonate content. Typically, NCV determinations are performed on every third blast-hole drilled. Additionally, geologists conduct field observations of blast-hole cuttings to assist in waste rock type determination while the material is being mined.

Once a waste rock type determination is made using NCV data and geologic inspection, the material is labeled with placards informing equipment operators where the material should be sent. Blast-hole samples with a negative NCV indicate PAG waste rock. This rock is routed to an area designated for PAG waste rock encapsulation. Positive NCV rock samples indicate non-PAG characteristics which are either: routed to a non-PAG disposal area, used for encapsulation of PAG, or used in construction projects. Geologists also monitor active pit areas to confirm determinations made from drill cutting samples.

Approximately 86 million tons of waste rock would be mined from the proposed Emigrant mine pit area. Of this total, 1.1 percent (943,000 tons) is projected to be PAG (carbon sulfur rock type). The remainder of waste rock is either net neutralizing (oxide carbonate) or oxide silicious, which is inert, slightly basic, or basic. During the first phases of mining, oxide waste rock would be stockpiled in a waste rock disposal facility located south of the pit area. In later phases of mining when PAG rock is encountered, Newmont proposes to selectively place PAG waste rock on and blended with Devils Gate limestone in mined-out portions of the pit. These areas would be selected to ensure PAG material is placed above oxide carbonate (Devils Gate limestone) portions of the pit. This would neutralize any potential leachate that may come from PAG rock material. Final encapsulation of PAG waste rock would be with a minimum 10-foot thick cover of non-PAG material and sloped to minimize infiltration of meteoric water.

HEAP LEACH FACILITY

Ore from the Emigrant Mine would be processed by run-of-mine oxide heap leach techniques. Metered amounts of lime (approximately 1 to 3 lbs/ton) would be added to the ore at the lime silo enroute to the heap leach facility. Coarse lime (minimum $^1/_8$-inch diameter) is added to the ore in order to maintain a consistent pH level of the cyanide solution used on the heap leach facility. The proposed location of the lime silo is shown on **Figure 2-2**.

The proposed heap leach facility would be constructed in three phases on approximately 370 acres (249 public and 121 private) in portions of Sections 1, 2, 11, and 12, Township 31 North, Range 53 East (**Figure 2-2**). Temporary surface water control ditches would be constructed around each successive phase of heap leach pad development. The heap leach pad would be developed in six construction stages: 1) remove and stockpile topsoil or growth media; 2) remaining subsoil and selected borrow materials blended and compacted to attain a low-permeability, (1×10^{-6} centimeters per second (cm/sec)) subgrade; 3) an 80-mil (0.080-inch), double-textured, high-density polyethylene (HDPE) liner installed; 4) 12-inch thick, fine-grained (100 percent passing a #4 sieve) gravel material placed over the liner as a protective layer; 5) an 18-inch thick coarse rock layer over the header pipe added to enhance drainage through the pad and minimize hydraulic head on the liner system; and 6) ore placed in successive lifts on the prepared base and liner (Newmont 2004c). A typical leach pad liner system is shown on **Figure 2-6.** Final design would be approved by NDEP.

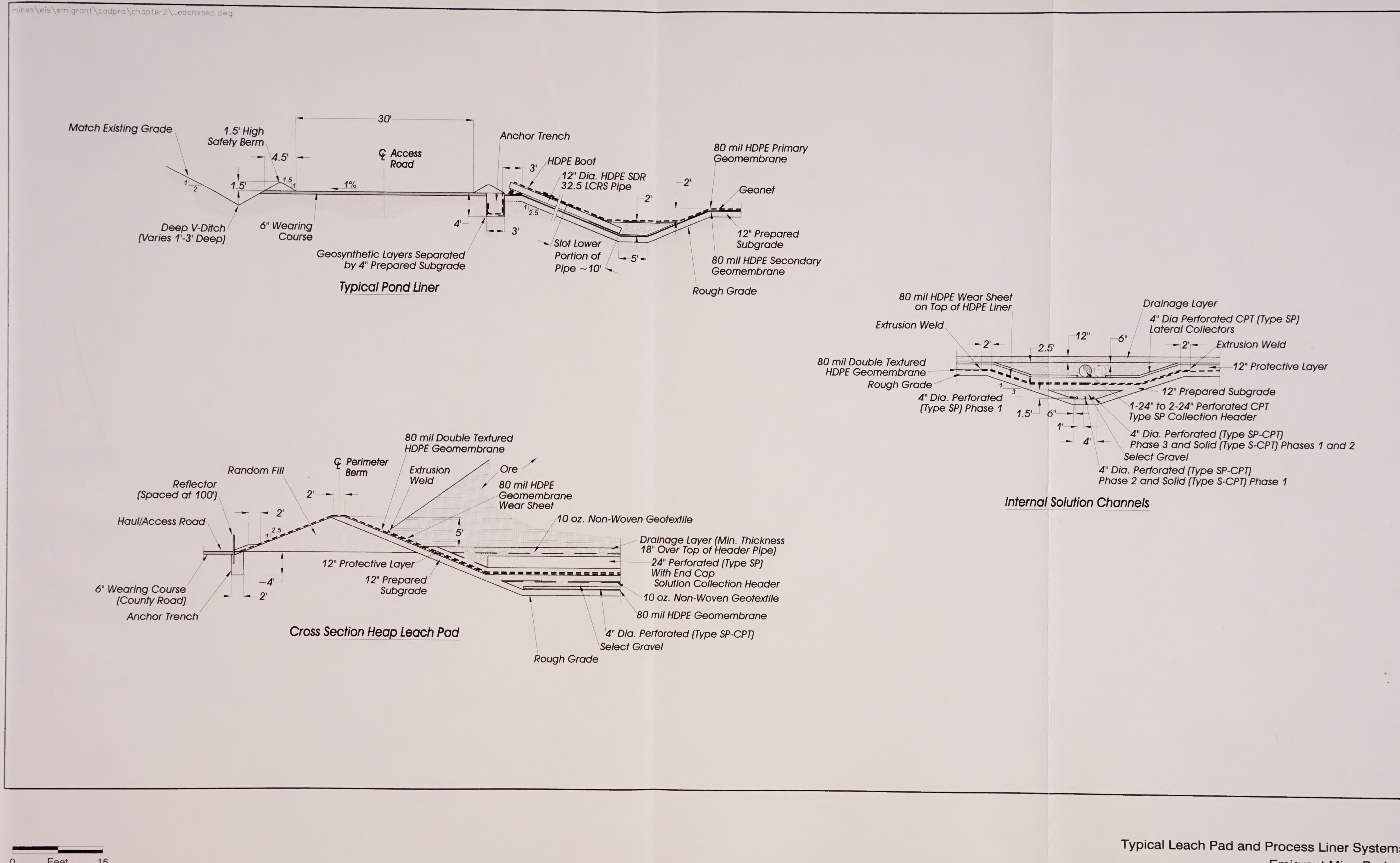
Three types of material would be used during construction of the heap leach facility: 1) prepared subgrade, 2) protective layer, and 3) drainage layer. Three borrow sources (**Figure 2-2**) would be developed to provide material for construction of these layers. The borrow source areas are described in detail later in this chapter.

A lined leak detection system would be installed under the areas of concentrated flow such as solution collection headers, to monitor potential seepage through the liner system. Perforated pipe would be installed in 80-mil HDPE-lined trenches cut into the subgrade material under key areas in the leach pad liner system. The leak detection system piping would report to a collection sump which would be monitored by site personnel.

Solution exiting the leach pad drainage system would pass through a launder box designed to allow direction of pregnant solution flow to the process ponds or directly to the process plant. Solution would be conveyed from the launder to its destination via HDPE piping installed in HDPE-lined pipe conveyance channels. The channels would be designed to contain all the potential flow volume in the piping and would serve as secondary containment in case of a release.

Ore would be placed on the heap leach pad in lifts ranging from 15 to 60 feet depending on topography and processing needs. Benches approximately 30 feet in width would separate each lift. The surface of each lift would be ripped to facilitate percolation of process solutions. A weak cyanide barren solution (barren of metals) would be applied to the surface using drip tubes or sprinklers.

The cyanide solution would migrate through the ore pile, dissolve the gold and silver contained in the ore, and drain to a central collection point at the base of the ore pile. Leach solution containing dissolved gold and silver would then be pumped from the collection point to a series of carbon columns, where the gold and silver are adsorbed onto the carbon. Process solution would then be recycled back to the leach pad for reuse. About once a week, loaded carbon (carbon containing metal) would be transported



Typical Leach Pad and Process Liner Systems
Emigrant Mine Project
Elko County, Nevada
FIGURE 2-6

to Newmont's Gold Quarry processing facility (about seven miles north of Carlin) for treatment.

Solution flow rates would be designed for 8,000 gallons per minute (gpm) to allow for surge capacity but would operate at 7,000 gpm. Water makeup for the heap leach facility would average about 200 gpm (approximately 100 million gallons per year for about four years) with most losses attributable to evaporation and moisture retention of the ore. Makeup water requirements would be reduced in subsequent years. Makeup water would be supplied from existing groundwater wells located in the Dixie Creek Valley currently used to supply water to the Rain Mine.

Three process ponds including two operational ponds approximately 325 by 350 feet, each with a capacity of 10 million gallons, and a stormwater (event) pond approximately 410 by 700 feet with a capacity of 30 million gallons, would be constructed approximately 800 feet southeast of the heap leach facility. The ponds would be designed with side-slopes of 2.5H:1.0V and depths ranging from 20 to 25 feet. The pond liner systems would be constructed as follows: from bottom to top, with 12 inches of prepared subgrade, secondary 80-mil HDPE geomembrane, leak detection system consisting of a geonet, and a primary 80-mil HDPE geomembrane. The geonet layer between the geomembrane layers allows for collection of fluids that could potentially seep through the primary geomembrane. A cross-section showing construction of the ponds is shown on **Figure 2-6**. The ponds would be connected by spillways such that flow would be contained within the two operational ponds before spilling to the stormwater pond. The heap leach facility and processing ponds would be fenced to preclude access by wildlife in accordance with NRS 502.390.

DIVERSION CHANNEL

The intermittent stream that extends through the southern portion of the proposed mine pit would be permanently diverted (**Figure 2-3**). Phased construction of the new channel is described in the *Mining Operations* section of this chapter. The channel would be relocated at or near the bottom of the drainage that would be re-shaped as a result of mining operations. Sediment basins would be constructed upstream and downstream of the diversion channel. These basins would be designed to trap sediment that may result from development or disturbance. A trapezoidal channel would be constructed in Devils Gate limestone or other remaining soil, lined where necessary, along a bench through the mine pit at approximately a 3 percent grade, which would be similar to the grade of the existing streambed.

The new diversion would be constructed in a manner consistent with standard trapezoidal channel design to accommodate a 500-year storm event. Culverts with reinforced concrete or non-PAG rip-rap headwalls would be installed where haul roads cross the channel. Culverts would be capable of conveying 100-year peak flow. Flow in excess of culvert capacity would pass over the roadway. The typical channel cross-section with erosion protection is shown on **Figure 2-7**. Non-PAG rip-rap would be incorporated into the diversion and at the discharge point to reduce potential coarse sediment effects. Applicable Clean Water Act (Section 404) permits would be obtained from the U.S. Army Corps of Engineers.

HAUL ROADS AND ACCESS/SERVICE ROADS

Development and operation of the Emigrant Project would require approximately 244 acres (232 public and 12 private) of disturbance for construction of haul, access, and service roads. Proposed haul roads would be 100- to 120-feet

wide (running width) to safely accommodate haul truck traffic with a maximum gradient of 10 percent. Haul roads would be maintained on a continuous basis to ensure safe, efficient haulage operations and to minimize fugitive dust emissions. Haul roads would be constructed using in-situ material; however, oxide or neutral mine waste rock (non-PAG) may be used, as necessary, for construction or routine maintenance. Access and service roads would be constructed to an average width of 35-feet using in-situ materials and waste rock similar to haul roads. The service road from the Rain Mine Shop complex to the Emigrant Mine is shown on **Figure 2-2.** An existing road right-of-way would be relocated around the heap leach facility.

ANCILLARY FACILITIES

Existing ancillary facilities at the Rain Mine including an operations office, expanded maintenance shop, equipment fueling, and warehouse would be used for the proposed Emigrant Project. Facilities to be constructed at the Emigrant Mine include: truck ready line, electrical substation, bioremediation cell for hydrocarbon-contaminated soil, and equipment fueling facility. These facilities would be constructed on the first lift of the waste rock disposal facility as shown on **Figure 2-2**. Existing similar facilities at the Rain Mine would be used until the first lift of the waste rock disposal facility has been placed and construction of respective facilities completed.

The equipment fueling facility, constructed on the first lift of the waste rock disposal facility, would consist of above ground storage tanks with total capacity of approximately 30,000 gallons of diesel fuel. A lined spill containment basin would be constructed around bulk storage tanks to contain 110 percent of the volume of the largest tank. A site-specific emergency response plan would be developed.

GROWTH MEDIA STOCKPILES

Growth media would be stockpiled for future use in reclaiming disturbed areas. Proposed growth media stockpile areas for material salvaged from Phase I of the heap leach facility, waste rock disposal facility, and initial pit development are shown on **Figure 2-2**. Growth media salvaged during construction of Phases II and III of the heap leach facility would be stockpiled in the north end of Borrow Area #1. The following estimates are for initial development only, and do not include additional growth media available for reclamation that would be salvaged during phased development of the heap leach facility and borrow areas.

Stockpile #1 would contain approximately 318,000 cubic yards (cy) of material stripped from Phase I construction of the heap leach facility. Stockpile #2 would contain approximately 50,000 cy of material salvaged from Borrow Area #1. Stockpile #3 would contain approximately 10,000 cy of material stripped from the initial mine pit during Phases I and II. Stockpile #4 would contain approximately 414,000 cy of material salvaged from Phases II and III of the heap leach facility. Stockpile #5 would contain approximately 186,000 cy of material salvaged from the base of the waste rock facility. In addition, there would be several small stockpiles created within the new haul road footprint during construction of the road.

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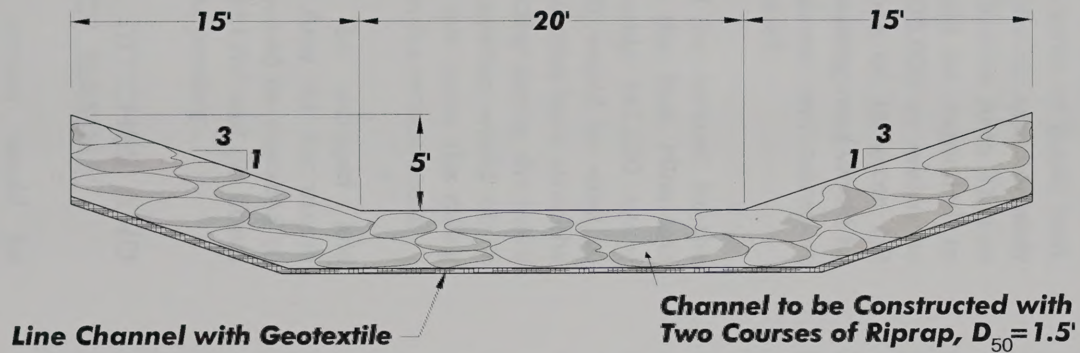


Typical Cross-section of Diversion Channel

Scale: 1"=10'

Cross-section of Diversion Channel
Emigrant Mine Project
Elko County, Nevada
FIGURE 2-7

BORROW AREAS

Newmont proposes to develop three borrow areas to provide material for construction of the heap leach facility and growth media for use in reclamation. Locations of borrow sources are shown on **Figure 2-2**.

Borrow Area #1 would be located adjacent to the waste rock disposal facility and would disturb approximately 83 acres of public land. This Borrow Area would provide approximately 1,309,500 cy of material. Borrow Area #2 is an existing source and would be expanded to produce approximately 475,000 cy within an existing surface disturbance of 16 acres (13 private and 3 public). An existing road would be widened and used to access and transport material from Borrow Area #2.

Borrow Area #3 would be located in the existing tailing facility at the Rain Mine and would provide approximately 165,000 cy of material. Borrow Area #3 would be used to provide material for a protective layer over the liner on the heap leach facility during the initial year of construction. Excavation would occur only in areas that would not cause the tailing pond water to encroach on the embankment.

Growth media would be salvaged and stockpiled from Borrow Area #1 for use in reclamation. Final slopes would be regraded to an overall average of 3.0H:1.0V and pit floors graded to drain and prevent ponding.

WATER CONTROL DITCHES AND SEDIMENT CONTROL BASINS

Surface water control ditches would be constructed as necessary around surface facilities, heap leach facility, and waste rock disposal facility to control stormwater run-on to these sites. Surface water control ditches and sediment retention ponds would be designed and constructed in accordance with Best Management Practices (BMPs) as outlined in the Handbook of Best Management Practices (Nevada State Conservation Commission 1994) and a Stormwater Pollution Prevention Plan. Sediment ponds and diversion ditches would be sized to contain a 100-year/24-hour precipitation event of 2.8 inches. Locations of sediment control basins are shown on **Figure 2-2.**

Newmont would obtain a stormwater discharge permit for the Emigrant Project. Information such as design criteria, monitoring requirements, and a Stormwater Pollution Prevention Plan would be required prior to issuance of a stormwater permit. Stormwater would be controlled using BMPs as defined by Nevada State Conservation Commission (1994). These BMPs address material handling procedures that minimize exposure of materials to stormwater; define spill prevention and response measures; identify sediment and erosion control measures; and describe physical stormwater controls. Stormwater run-on would be controlled by interceptor ditches upgradient of surface facilities. Interceptor ditches would be designed and constructed to accommodate a 100-year/24-hour precipitation event (2.8 inches). Ditches would divert uncontaminated run-on water back into the natural drainage down gradient from disturbed areas.

Newmont would construct berms and ditches as appropriate to preclude meteoric water from flowing into mine pits, or onto the waste rock disposal facility. Sediment control structures would include silt traps and fences using certified weed free straw, hay bales, or geotextile fabric, and sediment ponds. Newmont would maintain these structures throughout the life of the mine.

LANDFILL/HYDROCARBON SOIL TREATMENT

An existing Class III-waivered landfill at the Rain Mine would be used for disposal of approved

inert solid waste including wood, rock, bricks, concrete, and vehicle tires.

A hydrocarbon bioremediation facility would be constructed to treat petroleum hydrocarbon contaminated soil on an inactive portion of the external waste rock disposal facility at the Emigrant Mine. Hydrocarbon contaminated soil could result from petroleum spills or leaks occurring at the Project Area.

ENERGY

Electrical energy would be provided by accessing an existing 25-kilovolt line servicing the Rain Mine. An existing line supplying power to water wells in Dixie Valley would be rerouted around the heap leach facility as shown on **Figure 2-2**. A new 3000-KVA electrical substation would be constructed near the southeast end of the leach facility. An additional 1000-KVA substation would be constructed on the ready line located on the waste rock disposal facility.

WATER SUPPLY WELLS AND WATER USE

Two water supply wells were installed by Newmont during 1988 along Dixie Creek to provide water for the Rain Mine. Well logs show that the production wells (RPW-1and RPW-2) were drilled to depths ranging from 700 to 860 feet below ground surface and collectively produce up to 1,500 gpm. Water from these production wells is transported six miles to the Rain Mine by a 12-inch diameter buried pipeline within right-of-way (N-47282) issued by BLM to Newmont. The right-of-way also includes an overhead powerline and access road.

Water use at the Rain Mine will continue for about another five years at an expected rate of 5 to 10 million gallons per year, which has been the pumping volume for the Rain Mine since 1995 (Newmont 2004d). The proposed volume to be pumped from the Dixie Creek Valley production wells for the Emigrant Project would total about 130 million gallons per year (105 million as make-up water for the heap leach facility and 25 million gallons for dust suppression, equipment wash bay, potable, and sanitary). The combined pumping volumes for the Emigrant Mine and Rain Mine for a 5-year period, therefore, would be approximately 135 to 140 million gallons annually. Water make-up requirements at the Rain Mine peaked in 1991 at 138 million gallons annually.

GEOLOGIC EVALUATIONS

Newmont proposes to continue geologic evaluations (gold exploration) within the Project Area during the life of the Project under the previously approved Emigrant Springs Exploration Project Plan of Operations (N-071065). Geologic evaluation activities would include exploration and development drilling, geochemical sampling, excavation of test pits, trenching, and application of various geophysical methods. Surface disturbance created by drilling operations would consist of construction of roads, drill pads, and sumps. Surface disturbance associated with exploration activities is shown in **Table 2-1**. These activities would be conducted in accordance with applicable BLM and NDEP regulations.

WILDLIFE PROTECTION

FENCING

The heap leach facility and process ponds would be fenced to preclude access by terrestrial animals. The fence would be 8 feet high, the bottom 4 feet of which would be composed of woven or mesh wire with not greater than 2-inch mesh on the bottom 2 feet and a maximum of 8-inch mesh on the top. The bottom would be placed tight to the ground level to prevent animals from gaining access under the fence. The remainder of the fence above the woven or mesh wire would be smooth or barbed wire with a spacing of 10, 12, and 14 inches beginning

from the top of the woven or mesh wire. If cyclone or chain-link fence is used, the only applicable conditions would be the 8-foot height and tight-to-ground requirement.

COVERING/CONTAINMENT

Process ponds containing chemicals in solution at levels lethal to wildlife (e.g., barren and pregnant solution ponds) would be covered or contained to preclude access by birds and bats. Covers or containers would be maintained to preclude access by wildlife for as long as the pond contains solution. NDOW representatives would periodically check on the status and efficacy of the protective measures.

RESOURCE MONITORING

AIR QUALITY

Emissions from the lime silo would be monitored in accordance with requirements imposed by an NDEP air pollution permit. Fugitive emissions would be controlled using BMPs as defined by the Nevada State Conservation Commission (1994). Dust emissions would be controlled through use of direct water application, chemical binders or wetting agents, dust collection devices, water sprays, and revegetation of disturbed areas concurrent with operations.

WATER RESOURCES

Water resources in the Project Area would be monitored within the Dixie Creek hydrographic basin and possibly South Fork Humboldt River as part of Newmont's Plan of Operations. The monitoring program would be developed in conjunction with NDEP to address groundwater, springs/seeps, and streams/rivers. The purpose of hydrologic monitoring is to establish baseline data and report changing conditions as mining and ore processing operations are conducted in the area. A minimum of two monitoring wells would be installed, both upgradient and downgradient, of the Project Area. Water quality, groundwater levels, and surface water flow would be measured as required at designated monitoring wells, springs/seeps, and surface water stations. Monitoring reports would be prepared by Newmont to summarize water resources monitoring data collected.

CULTURAL RESOURCES

Cultural resource inventories have been completed for the Emigrant Project Area. New sites that may be discovered during future cultural inventories would be mitigated by Newmont in accordance with Section 106 of the National Historic Preservation Act. For additional discussion of cultural resources, see Chapters 3 and 4, *Cultural Resources*.

PALEONTOLOGICAL RESOURCES

In the event vertebrate fossils are discovered within the Emigrant Project Area during mining operations, Newmont would immediately notify the BLM Authorized Officer. Activities that could occur after notification include cessation of mining activities in the area of discovery, verification and preliminary inspection of discovery, and development/ implementation of plans to avoid or recover the fossils.

WILDLIFE

Newmont would obtain an Industrial Artificial Pond permit from the Nevada Department of Wildlife (NDOW) in accordance with NRS 501.181, 502.390, and NAC 502. Newmont would implement measures intended to prevent wildlife mortality occurring as a result of contact with the heap leach facility and associated process ponds. Newmont would maintain a record of wildlife mortalities associated with the permitted facility. Reports would be submitted quarterly to NDOW on forms provided by the Department. Newmont would report mortalities of wildlife species by

telephone to the regional office, no later than the beginning of the next working day following the occurrence or observation of those mortalities.

HAZARDOUS MATERIALS

QUANTITIES GREATER THAN REPORTABLE QUANTITIES

The term "hazardous materials" is defined in 49 CFR 172.101. Hazardous substances are defined in 40 CFR 302.4 and the Superfund Amendments and Reauthorization Act (SARA) Title III. Hazardous materials and hazardous substances that would be transported, stored, or used at the Emigrant Project in quantities greater than the TPQ designated by SARA Title III for emergency planning are summarized in **Table 2-3**.

Hazardous materials would be transported to the Emigrant Project Area via Highway 278 south of Carlin, thence approximately ten miles south on the Rain Mine road to the Rain Mine and then via mine access roads to the site. U.S. Department of Transportation (USDOT) regulated transporters would be used for shipment. USDOT approved containers would be used for on-site storage (Newmont 2004a), and spill containment structures would be provided. Hazardous materials would be stored in designated areas on private and public land.

QUANTITIES LESS THAN REPORTABLE QUANTITIES

Small quantities of hazardous materials less than the Threshold Planning Quantity (TPQ) not included in **Table 2-3** would also be managed at the Emigrant Project Area. These include auto and equipment maintenance products, office products, paint, and batteries.

TABLE 2-3
Hazardous Materials Management
Emigrant Project

Substance	Area Used/Stored	Rate of Use (per year)	Quantity Stored On-site	Storage Method	Waste Management
Diesel Fuel	Mine/truck shop	5,300,000 gal.	35,000 gal.	Bulk tank	No waste
Hydraulic Fluid	Mine/truck shop	-	5,000 gal.	Bulk tank totes, drums	Recycled
Motor Oil	Mine/truck shop	-	5,000 gal.	Bulk tank totes, drums	Recycled
Antifreeze	Mine/truck shop	-	5,000 gal	Bulk tank totes, drums	Recycled
Explosives	Prill Silo	8,000,000 lbs.	370,000 lbs	Silo	No waste
	Explosive (powder) magazine	50 tons	2,500 lbs	Magazine	No waste
Gasoline	Mine/truck shop	-	5,000 gal.	Bulk tank	No waste
Propane	Mine/surface	-	5,000 gal.	Bulk tank	No waste
Grease	Mine/truck shop	-	1,000 gal	Totes, drums	Recycled
Cyanide	Leach Pad	8,200,000 lbs.	7,000 gal	Bulk tank	No waste
Lime	Heap Leach Facility/Lime silo	26,000 tons	250 tons	Silo	No waste

gal = gallon; lbs. = pounds
Source: Newmont 2004b.

SPILL PREVENTION AND RESPONSE PROCEDURES

Newmont's Spill Prevention, Control, and Countermeasure (SPCC) Plan (Newmont 1997) states that all maintenance facilities would be equipped with spill response materials. Earth moving equipment would be available from the mining operation for constructing dikes. Above ground tanks and associated piping would be visually inspected for leaks on a daily basis. Bulk storage tanks would be constructed with secondary containment to accommodate 110 percent of volume of the largest tank.

Newmont personnel would be instructed in operation and maintenance of equipment to prevent discharge of oil. Spill response training would be provided through the Environmental Compliance Awareness Program outlined in Newmont's Emergency Response Plan (Newmont 2003a). Supervisors would schedule and conduct spill prevention briefings for personnel that would include a review of the SPCC Plan. Spills, malfunctioning components, and precautionary measures would be discussed during briefings.

HAZARDOUS WASTES

Hazardous waste generation, treatment, and disposal is regulated by the federal Resource Conservation and Recovery Act (RCRA)(40 CFR §260-270.) Under RCRA, Newmont would be considered a "conditional exempt small quantity generator," for activities at the Emigrant Project because less than 100 kilograms of hazardous waste would be generated each month.

Newmont has developed a waste minimization program to evaluate hazardous substances used on mine property. Where possible, alternative products that generate no waste or solid waste would be used, rather than RCRA-regulated hazardous waste. Hazardous wastes generated at the Emigrant Project would be transported to permitted waste disposal facilities by licensed waste haulers. When practicable, the wastes would be sent to recycling facilities.

HUMAN HEALTH AND SAFETY

Human health and safety at the Emigrant Project would be regulated by the federal Mine Safety and Health Act of 1977 (MSHA), which sets mandatory safety and health standards for surface metal and nonmetal mines. The purpose of these health and safety standards is the protection of life, promotion of health and safety, and prevention of accidents. MSHA regulations are codified under 30 CFR Subchapter N, Part 56. Employees at the Emigrant Project would be required by Newmont to receive training as outlined in **Table 2-4.**

EMPLOYMENT

The Emigrant Project would employ approximately 180 people. Most of the work force for the Project would be from existing mine-related work forces in the Carlin area. The construction work force for the Emigrant Project would be approximately 100 people during initial construction phases decreasing to approximately five employees during final phases of construction. Construction and development are expected to require approximately 12 months.

RECLAMATION

Reclamation activities for the Emigrant Project are designed to achieve post-mining land uses consistent with BLM's Resource Management Plan (BLM 1987) for the Elko Field Office. Reclamation is intended to return disturbed land to a level of productivity comparable to pre-mining levels associated with adjacent land. Post-mining land uses include wildlife habitat, livestock grazing, dispersed recreation, mineral

exploration, and development. Certain mine components (e.g., last phase of mine pit) may have restrictive post-mine land uses.

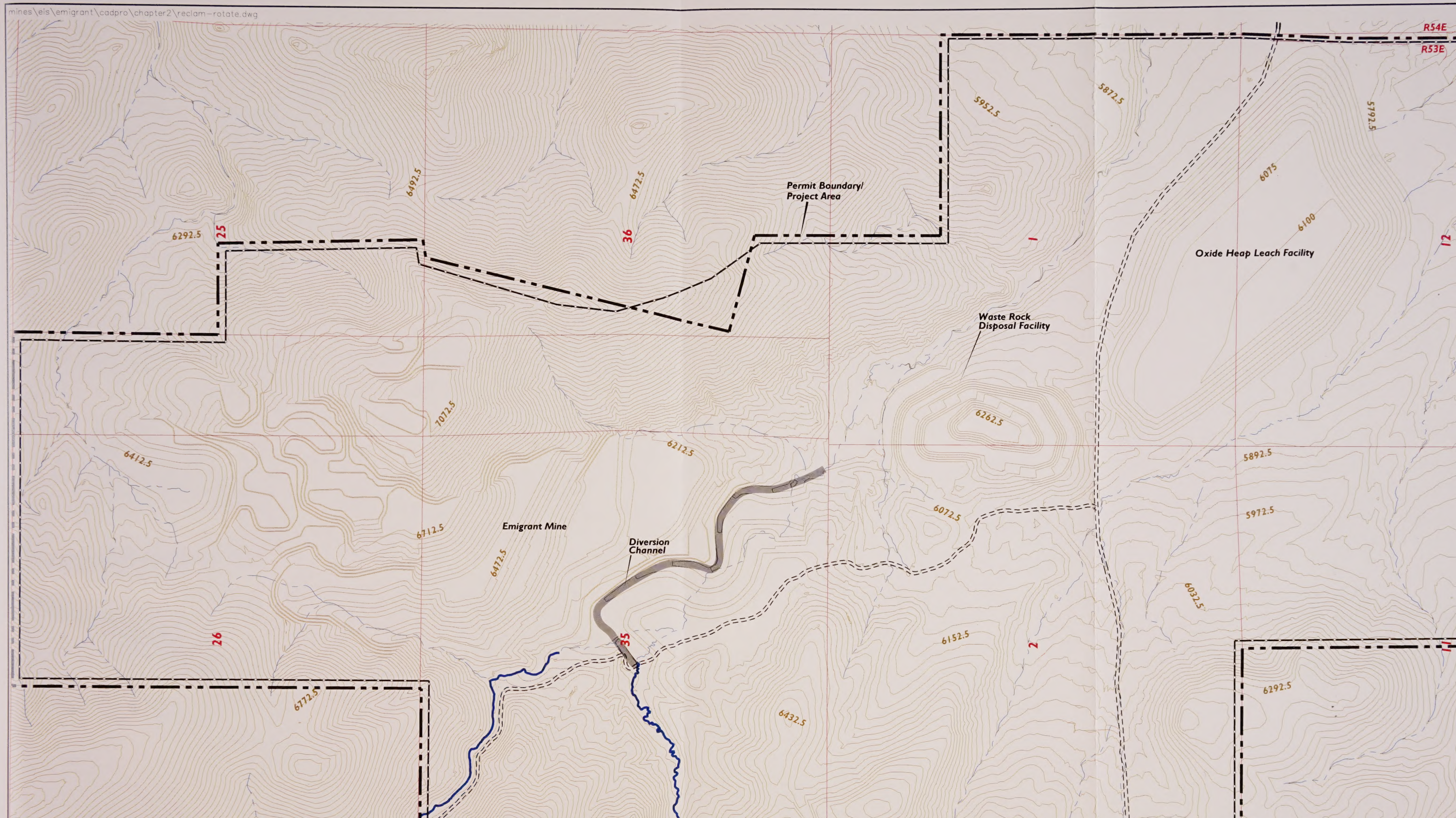
Short-term reclamation goals would be to stabilize disturbed areas and protect disturbed and adjacent undisturbed areas from unnecessary or undue degradation. Long-term reclamation goals would be to ensure public safety, stabilize the site, and establish a productive vegetative community consistent with post-mining land uses.

Reclamation activities would include regrading the waste rock disposal facility, backfilled portions of mined-out pit areas, borrow areas, and heap leach facility, removal of structures after cessation of operations, regrading disturbed areas (including roads), drainage control, well closure (e.g., piezometers), removal and regrading stockpile areas, replacement of salvaged soil, revegetation, and reclamation monitoring (Newmont 2004e). The reclamation schedule would encompass the period between cessation of mining through post-reclamation monitoring. Reclamation would take place concurrent with operations where possible. The proposed post-reclamation topography for the Emigrant Project is shown on **Figure 2-8**. A Closure Plan meeting State of Nevada requirements (NAC 445A.447) must be filed with NDEP two years prior to closure of the mine.

TABLE 2-4
Emigrant Project Health and Safety Training Programs

Course	Personnel	Frequency	Duration	Instruction
New-hire Training	All new hires exposed to mine hazards	Once	24 hours	Employee rights Supervisor responsibilities Self-rescue Respiratory devices Transportation controls Communication systems Escape and emergency evacuation Ground control hazards Occupational health hazards Electrical hazards First aid Explosives Toxic materials
Task Training	Employees assigned to new work tasks	Before new assignments	Variable	Task-specific health and safety procedures Supervised practice in assigned work tasks in nonproductive duty
Refresher Training	All employees who received new-hire training	Yearly	8 hours	Required health and safety standards Transportation controls Communication systems Escapeways, emergency evacuations Fire warning Ground control hazards First aid Electrical hazards Accident prevention Explosives Respirator devices
Hazard Training	All employees exposed to mine hazards	Once	Variable	Hazard recognition and avoidance Emergency evacuation procedures Health standards Safety rules Respiratory devices

Source: Newmont 2004a.



N

0 Feet 1200

Contour Interval = 20'

Legend

Proposed Diversion Channel

Access Road

Existing Drainage

Perennial Flow

Proposed Perimeter Fence

Reclamation Contour Map
Emigrant Mine Project
Elko County, Nevada
FIGURE 2-8

SOIL SALVAGE

As proposed mine areas, borrow sources, haul and access roads, stockpile sites, heap leach pad, and waste rock disposal areas are developed, Newmont would recover available growth media for future use in reclaiming disturbed areas. After completion of Phase I and II mine operations, growth media would be salvaged from active mine areas and direct hauled for placement over backfilled portions of previously mined out pits where possible. Growth media would be salvaged and transported to stockpiles using scrapers, wheel dozers, track dozers, haul trucks, and loaders. Newmont would implement BMPs to reduce soil loss from stockpiles by constructing run-off control berms, mulching, addition of organic matter, interim seeding, or leaving slopes in roughened condition. Soil suitability and salvage depths of growth media are summarized in Chapter 3, *Soil Resources*.

GRADING DISTURBED AREAS

Prior to replacing growth media, facility sites would be regraded to create a stable post-mining configuration for disturbed areas, establish effective drainage to minimize erosion, and protect surface water resources. To the extent practicable, grading would blend disturbed areas with the surrounding terrain. Angular features, including tops and edges of waste rock disposal facilities, would be rounded.

Prior to initiating the proposed reclamation vegetation plan, Newmont would evaluate growth media replacement depths. Soil replacement depths would vary according to location and soil type. The variety of replacement depths would provide different vegetation mosaics on reclaimed areas. Regraded surfaces would be ripped where necessary prior to placement of growth media. Ripping would reduce compaction and provide a uniform seed bed.

REVEGETATION

Newmont's revegetation program goals are to stabilize reclaimed areas, ensure public safety, and establish a productive vegetative community based on the Resource Management Plan for the Elko Field Office (BLM 1987) and designated post-mining land uses (Newmont 2004a). Seed mixes proposed for use on the waste rock disposal facility, waste rock placed as backfill in mined-out pits, and borrow areas are shown in **Table 2-5**. Modifications to the seed list, application rates, cultivation methods, and techniques could occur based on success of concurrent reclamation. Site-specific seed mixtures and application rates would be developed through consultation with and approval by BLM, NDEP and NDOW. Seedlings may be substituted for seeds. The seed mix selected would represent a Reclaimed Desired Plant Community and the mix would be appropriate for each ecological site in the Project Area. A perimeter fence along the permit boundary would remain in place until vegetation is established on reclaimed areas.

Newmont would conduct annual weed surveys to direct weed control efforts. Monitoring weed infestations and weed control would continue until reclamation is complete and potential for weed invasion is minimized. Certified weed free straw bales would be used for sediment control.

TABLE 2-5
Plant List for Emigrant Project Area

Grasses	
Bluebunch wheatgrass	*Agropyron spicatum*
Thickspike wheatgrass	*Agropyron dasystachyum*
Streambank wheatgrass	*Agropyron riparium*
Western wheatgrass	*Agropyron smithii*
Sandberg bluegrass	*Poa sandbergii*
Great Basin wildrye	*Elymus cinereus*
Indian ricegrass	*Oryzopsis hymenoides*
Webber ricegrass	*Oryzopsis webberi*
Idaho fescue	*Festuca idahoensis*
Thurber needlegrass	*Stipa thurburiania*
Bottlebrush squirreltail	*Sytantion hystrix*
Crested wheatgrass	*Agropyron cristatum*
Sheep fescue	*Festuca ovina*
Slender wheatgrass	*Agropyron trachycaulum*
Canby bluegrass	*Poa canbyi*
Sand dropseed	*Sporabolus cryptandrus*
Forbs	
Yellow sweetclover	*Melilotus officinalis*
Cicer milkvetch	*Astragalus cicer*
Northern sweetvetch	*Hedysarum boreale*
Buckwheat	*Eriogonum*
Common sainfoin	*Onobrychis viciaefolia*
White sweetclover	*Melilotus alba*
Alfalfa	*Medicago sativa*
Annual ryegrass	*Lolium perenne multiflorum*
Barley	*Hordeum*
Western Yarrow	*Achillea millefolium*
Blue flax	*Linum lewisii*
Gooseberry leaf globemallow	*Sphaeralcea grossulariaefolia*
Small burnet	*Sanguisorba minor*
Scarlet globemallow	*Sphaeralcea coccinea*
Desert globemallow	*Sphaeralcea ambigua*
Arrowleaf balsamroot	*Balsamhoriza saggitata*
Palmer penstemon	*Penstemon palmeri*
Shrubs	
Wyoming big sagebrush	*Artemisia tridentata var. tridentata, wyomingensis*
Antelope bitterbrush	*Purshia tridentate*
Serviceberry	*Amelanchier (alnifolia) utahensis*
Snowbrush	*Ceanothus spp.*
Winterfat	*Ceratoides lanata*
Chokecherry	*Prunus virginiana*
Black sagebrush	*Artemisia nova*
Shadscale	*Atriplex confertifolia*
Fourwing saltbush	*Atriplex canescens*
Prostrate kochia	*Kochia prostrate*
Rubber rabbitbrush	*Chrysothamnus nauseosus*
Mormon tea	*Ephedra (nevadaensis) (viridis)*
Currant	*Ribes spp.*
Woods rose	*Rosa woodsii*
Snowberry	*Symphoricarpos spp.*

Source: Newmont 2004a.

CONCURRENT RECLAMATION

As various facilities reach the end of their period of use, Newmont would initiate reclamation activities concurrent with ongoing mining operations. As mining operations progress uphill (north), backfilled portions of the pit would be concurrently regraded, topsoiled, and seeded. In some areas, growth media would be temporarily stockpiled to allow adequate backfilling and regrading of mined-out portions of the pit prior to placement of growth media.

WASTE ROCK DISPOSAL FACILITY

External Waste Rock Disposal Facility

The waste rock disposal facility associated with the Emigrant Project would be regraded to an overall average slope of 3.0H:1.0V for the 150-foot height of the facility. Grading would be done to minimize rill erosion, facilitate reclamation activities (seeding, mulching), and provide a surface that would support vegetation. The top of the waste rock disposal facility and the remaining benches would be graded to promote runoff and limit ponding of precipitation and snowmelt. A conceptual closure plan for the waste rock disposal facility is shown on **Figure 2-9.**

Upon completion of grading, topsoil or other suitable growth medium would be redistributed to a depth sufficient to support vegetation. Waste rock would be regraded, ripped (to relieve compaction from mining equipment), and seeded according to the reclamation plan (Newmont 2004e).

In-Pit Backfill

Waste rock generated during Phase III through VIII mining would be placed in previously mined out portions of the pit. PAG waste rock encountered during these phases would be blended and encapsulated with acid neutralizing oxide waste. Encapsulation cells would be located where Devils Gate limestone (bedrock) is exposed in mined-out portions of the pit. An oxide waste rock cap would also be placed over each encapsulation cell to isolate PAG material from atmospheric oxygen, precipitation, and snow melt.

The last pit mined would not be backfilled but day-lighted to provide drainage. Safety berms and signage would be constructed around the highwall perimeter.

HEAP LEACH FACILITY

When recovery of gold from the heap leach facility is no longer cost-effective, the addition of cyanide to the process solution would cease. Residual solution draining into the process pond would be pumped to evaporative sprays located on the leach pad. The total volume of solution in the pad and pond system would be reduced by evaporation, until flow has diminished to a point that it can be treated passively.

As drain-down from the process circuit subsides, evapotransporation cells would be constructed by modifying the process ponds. These modifications would consist of placing growth media in the pond area, and constructing a solution distribution network of slotted pipe, drip-tube, and gravel to distribute water throughout the pond area, either on the surface or within a few feet of the surface. Vegetation would be established on the surface of the evapotransporation cells.

The leach pad would be recontoured to an overall average slope of 2.5V:1.0H, growth media would be placed as an evapotransporation cover, and revegetated. Regrading of the spent ore on the leach pad to achieve an overall average 2.5H:1.0V slope would not result in spent ore being placed outside of the liner system of the leach pad. Newmont would propose a cover for approval

by NDEP and BLM prior to construction or incorporation in the reclamation plan and cost estimate. The cover would store infiltrated water during the dormant season and become available for plant uptake during the growing season. A conceptual closure plan for the heap leach facility is shown on **Figure 2-10**.

ROADS

Roads associated with the Emigrant Project would be reclaimed concurrently with cessation of operations in each individual area. Roads remaining at the end of mining operations would be reclaimed when no longer needed for reclamation and access.

Haul roads associated with waste rock disposal areas would be reclaimed concurrently with closure of the disposal site. Haul roads not located on the waste rock disposal site would be reclaimed by regrading to provide proper drainage, ripping to reduce compaction, replacement of growth media, seed-bed preparation, and revegetation. The reclaimed roads would be regraded, to the extent practical, to reestablish original topography and drainage of the site and to control erosion. Culverts would be removed and natural drainage reestablished.

Exploration roads, drill pads, sumps, and trenches would be reclaimed in conjunction with ongoing operations. Exploration roads and drill pads would be bladed or formed using a dozer. The disturbed soil material would form the roadbed or drill pad. Upon reclamation, the disturbed soil material would be recontoured or regraded onto the disturbed area to blend with surrounding topography. Trenches would be backfilled and regraded to conform to the surrounding topography and drainages are reestablished.

ANCILLARY FACILITIES

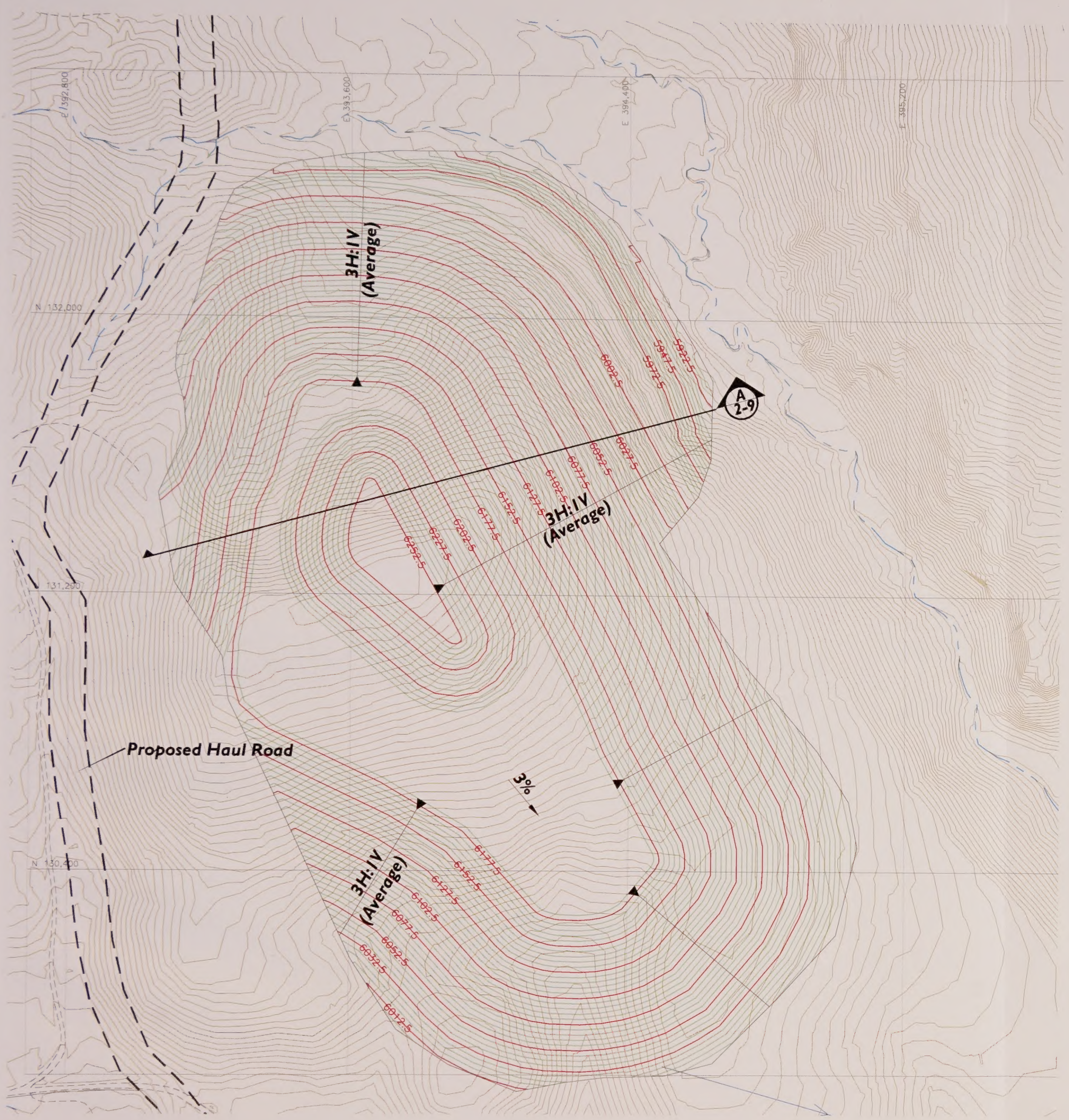
At the end of Project mine life, the explosives magazine, ancillary buildings, water supply pipeline, shop and office complex, and other mine support structures with salvage value would be dismantled for salvage or used for other operations in the area. Concrete foundations would be broken up to the extent possible and buried a minimum of 5 feet below ground surface or left intact and buried 10 feet below ground surface. These sites would be reclaimed by regrading to provide proper drainage, ripping to reduce compaction, replacement of growth media, seedbed preparation, and revegetation.

Unused explosives would be returned to the vendor or used at other mine sites in adjacent areas. Non-salvageable materials including scrap building materials and equipment would be buried onsite in the landfill or disposed of offsite in accordance with federal and state regulations. Hazardous material would be recycled or disposed of at approved landfills. The water pipeline would be reclaimed by plugging the pipe at both ends and allowing the pipe to remain buried.

MONITORING/EVALUATION OF RECLAMATION SUCCESS

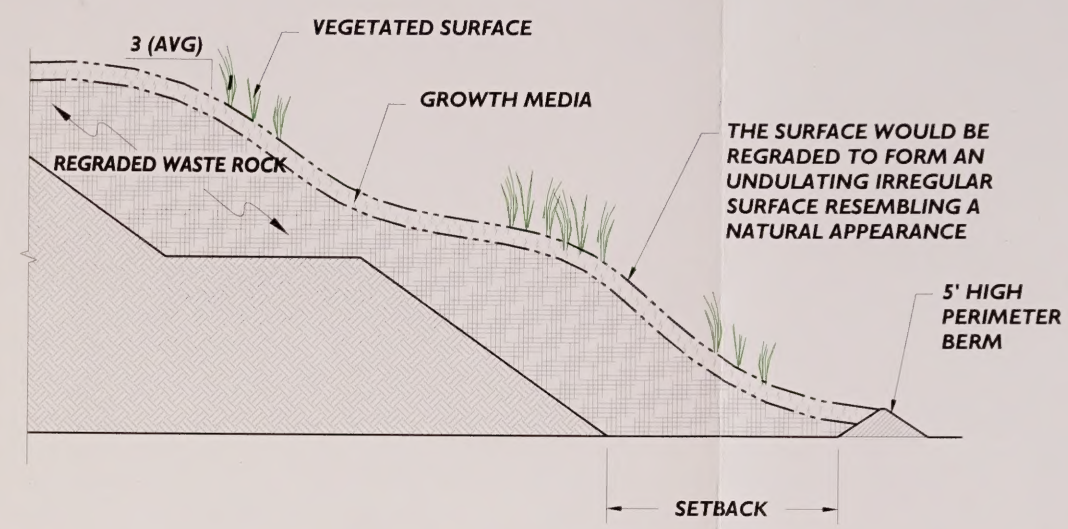
Newmont, in cooperation with BLM and NDEP, would evaluate the status of vegetative growth during three full growing seasons following completion of regrading, replacement of growth media, and planting. Final bond release may be considered at that time. Interim progress of reclamation at the Emigrant Project Area would be monitored as requested by the agencies. Water monitoring, as described in the *Resource Monitoring* section of this chapter, would also be used in evaluating reclamation success.

mines\eis\emigrant\cadpro\chapter2\wasteclose.dwg

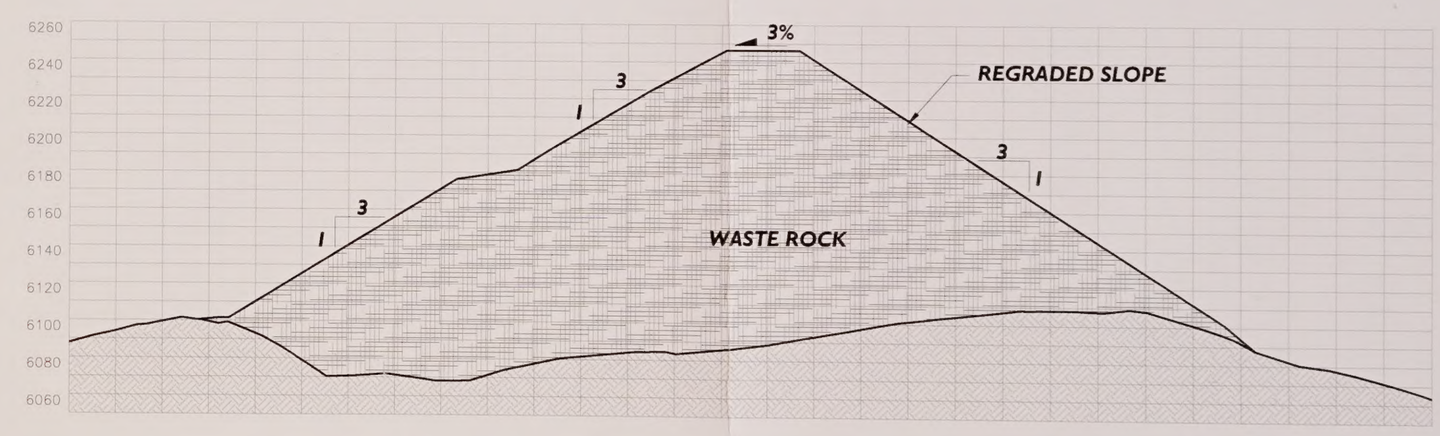


NOTES:

THE FINAL WASTE ROCK DISPOSAL FACILITY CAPPING SYSTEM DESIGN WILL BE COMPLETED DURING FINAL CLOSURE DESIGN TO ENHANCE EVAPORATION AND TRANSPIRATION SUCH THAT RUNOFF AND INFILTRATION ARE MINIMIZED.



TYPICAL WASTE ROCK DISPOSAL FACILITY SIDE SLOPE
Not to Scale



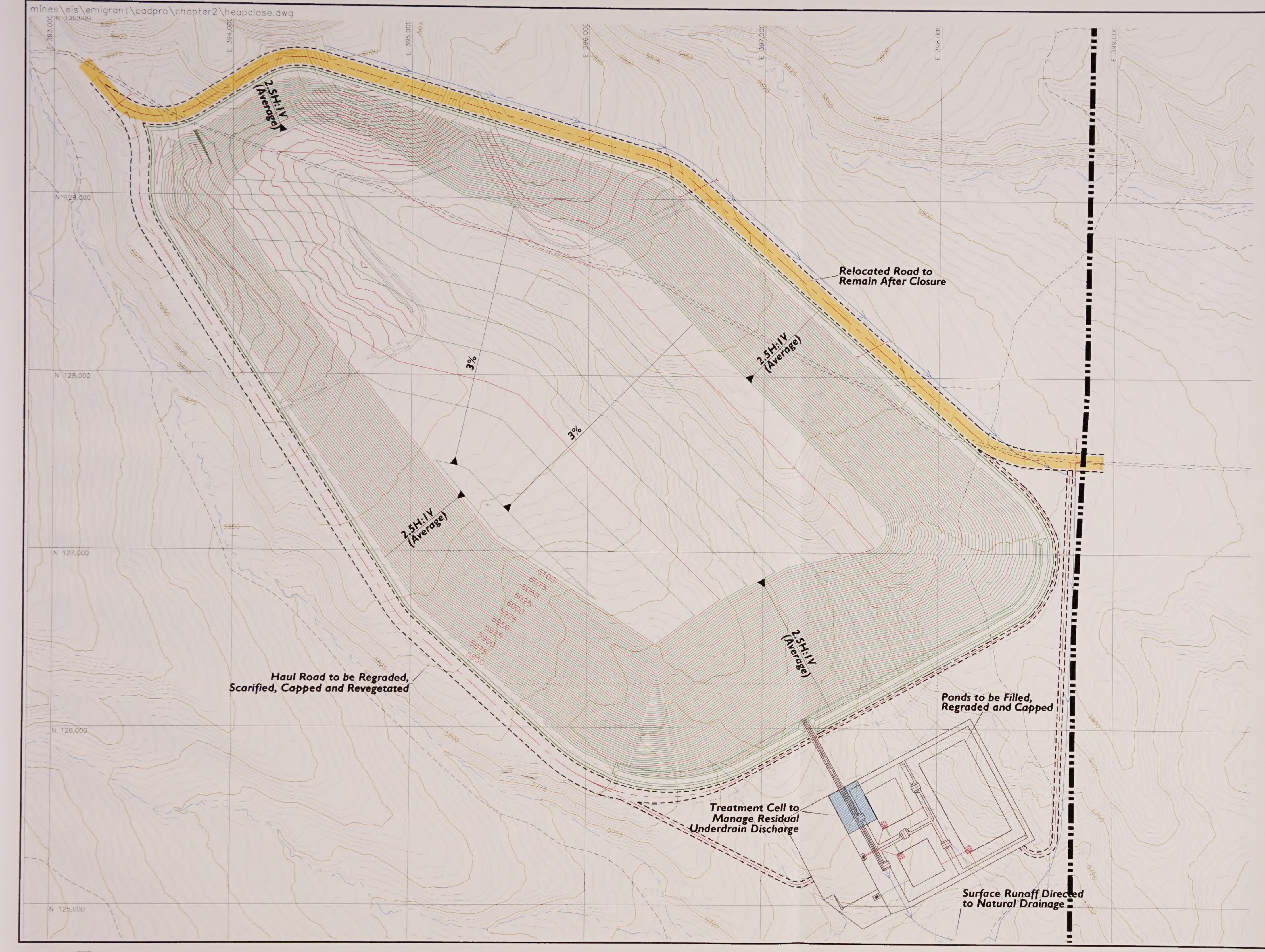
WASTE ROCK DISPOSAL FACILITY - SECTION A 2-9
Not to Scale

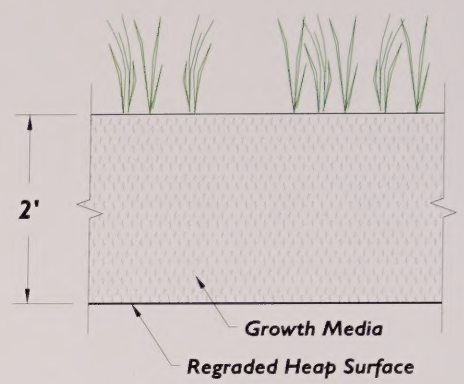
N

0 Feet 400

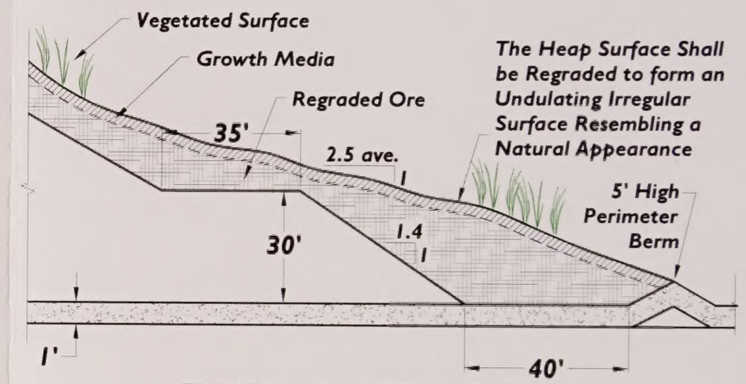
EXISTING GROUND SURFACE CONTOUR AND ELEV., FEET
5850 REGRADED WASTE ROCK SURFACE CONTOUR AND ELEV., FEET
EXISTING DRAINAGES
EXISTING ROAD/TRAIL
PROPOSED HAUL ROAD

Conceptual Closure Plan
Waste Rock Disposal Facility
Emigrant Mine Project
Elko County, Nevada
FIGURE 2-9





TYPICAL HEAP EVAPO-TRANSPIRATION CAPPING SYSTEM



TYPICAL HEAP SIDE SLOPE

NOTES:

1. THE FINAL HEAP CAPPING SYSTEM DESIGN WILL BE COMPLETED DURING THE FINAL CLOSURE DESIGN TO ENHANCE EVAPORATION AND TRANSPIRATION SUCH THAT RUNOFF AND INFILTRATION ARE MINIMIZED.
2. THIS PLAN ACCOUNTS FOR SURFACE WATER CONTROL ONLY FROM THOSE AREAS ASSOCIATED WITH THE HEAP LEACH FACILITY. THE ACTUAL CLOSURE PLAN MAY BE AFFECTED DEPENDING ON THE FINAL CLOSURE PLAN OF UPSTREAM FACILITIES.
3. TOPSOIL WILL BE STRIPPED FROM THE FACILITIES AND BORROW AREAS PRIOR TO CONSTRUCTION AND STOCKPILED FOR REUSE AS CAPPING MATERIALS.

EXISTING GROUND SURFACE CONTOUR AND EL, FEET
REGRADED HEAP SURFACE CONTOUR AND EL, FEET
EXISTING DRAINAGES
PERMIT BOUNDARY/PROJECT AREA
LOCATION AND DIRECTION OF PERMANENT DIVERSION CHANNEL
RELOCATED ROAD (TO REMAIN)
EXISTING ROAD/TRAIL

Conceptual Closure Plan
Heap Leach Facility
Emigrant Mine Project
Elko County, Nevada
FIGURE 2-10

POST-CLOSURE MONITORING

WATER RESOURCES

Upon completion of closure, Newmont would monitor groundwater quality for a minimum of five years. Surface water monitoring would continue until vegetation is established and/or until monitoring is determined by BLM and NDEP to no longer be necessary.

VEGETATION

Reclamation goals for mining disturbances are 1) stabilize the site, and 2) establish a productive community based on the applicable land use plan and designated post-mining land uses. The revegetation release criteria for reclaimed mine sites would be to achieve as close to 100 percent of the perennial plant cover of selected comparison areas as possible. The comparison, or reference, areas would be selected from representative plant communities adjacent to the mine site, test plots or demonstration areas or, as appropriate, representative ecological or range site descriptions.

PROJECT ALTERNATIVES

No component of the Proposed Action was determined to have potentially adverse impacts requiring an alternative to eliminate or reduce impacts. Therefore, the only alternative discussed in detail in this EIS is the No Action Alternative. Minor issues and potential impacts identified in Chapter 4, *Consequences of Proposed Action and No Action Alternative*, are addressed with specific mitigation measures.

NO ACTION ALTERNATIVE

Under the No Action Alternative, the Proposed Action would not be approved. Newmont would not be authorized to develop the defined ore reserves, construct ancillary mine facilities, place waste rock in the disposal facility, or construct the oxide heap leach facility on public land. Potential impacts predicted to result from development of the Project would not occur.

ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

This section describes alternatives to the Proposed Action that were eliminated from further review in the EIS. These alternatives were identified during the public scoping process or by BLM during review and analysis of the Proposed Action. These alternatives were considered technically infeasible, unreasonable, provided no advantage over the Proposed Action, or would not meet the purpose and need of the Proposed Action. The rationale for dismissing these alternatives is provided.

USE EXISTING HEAP LEACH FACILITY AT RAIN MINE

This alternative would include all components of the Proposed Action but would require Newmont to haul ore approximately 2.5 miles from the Emigrant Mine to the existing heap leach facility at the Rain Mine. This alternative could eliminate the need to construct the proposed heap leach facility at the Emigrant Mine site.

Rationale for Dismissal

The existing heap leach facility at the Rain Mine encompasses approximately 40 acres and expansion of this facility to accommodate up to 94 million tons of ore from the Emigrant Project would require an additional 320 acres of leach area. Expansion of the existing heap leach facility to accommodate proposed ore production from the Emigrant Mine would require extensive reconstruction of the existing

heap leach pad. Such an expansion at the Rain Mine was determined to not have an advantage over the Proposed Action.

CONSTRUCT NEW OFFICE AND MAINTENANCE SHOP COMPLEX AT EMIGRANT MINE SITE AND COMPLETE ROAD UPGRADE

Implementation of this alternative would include construction of all components of the Proposed Action but would require Newmont to construct a new Office and Maintenance Shop Complex near the northwest corner of the proposed heap leach facility in the SW¼, Section 2, Township 31 North, Range 53 East. This alternative would also require upgrading the existing two-track road to accommodate haul truck traffic.

Rationale for Dismissal

This alternative was dismissed from further analysis because it would require approximately 22 acres of new surface disturbance compared to the Proposed Action and would not provide any environmental advantage over the Proposed Action.

REGRADE BACKFILLED AREAS TO ELIMINATE TERRACES

This alternative would include implementation of all components of the Proposed Action and would require regrading of backfilled mine panels to eliminate flat terraced surfaces associated with the backfill operation.

Rationale for Dismissal

This alternative was eliminated from further analysis because regrading backfilled areas to eliminate flat surfaces would increase the erosional energy on slopes associated with the backfilled areas, which could increase the amount of soil loss from the regraded areas. The terraced configuration of the backfilled areas would provide flat areas that would effectively collect and trap soil that erodes from intervening slopes between terrace areas until vegetation is established.

SUMMARY OF POTENTIAL IMPACTS AND MITIGATIONS

Potential impacts resulting from implementation of the Proposed Action along with mitigation and monitoring measures to reduce or eliminate impacts are summarized in **Table 2-6**.

TABLE 2-6
Potential Impacts and Mitigation/Monitoring Measures
Emigrant Project

Resource	Impacts	Recommended Mitigation/Monitoring
Air Quality	Fugitive dust.	Roads would be watered and treated as necessary to limit fugitive dust.
Water Quality/Quantity	Potential for sedimentation; Potential for acid mine drainage; Potentials for impacts on groundwater quantity.	See Wetland/Riparian (reconstruct/maintain Emigrant Spring enclosure; fence wetlands and riparian areas; natural design for stream channel diversion); Water quality monitoring plan (BLM, NDEP, Newmont) with contingency provisions; Monitor groundwater quality in the vicinity of the mine pit, waste rock disposal facility, and heap leach facility for constituents of concern; Monitor surface water flow and quality in drainage channels in the vicinity of the Project Area, including Dixie Creek and possibly South Fork Humboldt River; and Monitor depth to groundwater in production wells and piezometers located in Dixie Creek Valley.
Upland Vegetation Including Invasive, Non-Native Species	Loss of native plant communities.	Newmont would conduct annual weed surveys to direct weed control efforts. Newmont's weed control efforts would be continued for the life-of-mine and reclamation period to reduce potential impacts of new infestations. Certified weed free straw bales would be used for sediment control; Planting and seeding techniques would be coordinated with BLM and NDOW at closure; and Implement reclamation measures that favor establishment of big sagebrush on portions of the site. Special measures would be coordinated with BLM and NDOW to control soil loss associated with big sagebrush planting.
Wetland/Riparian	Loss of 0.15 acre wetlands, 0.88 acre non-wetland Waters of U.S.; Stream channel diversion.	Natural design for stream channel diversion (will facilitate growth and establishment of riparian vegetation); Reconstruct/maintain Emigrant Spring enclosure (using Liberty pipe or equivalent in problem areas); and Fence wetlands, riparian areas and springs adjacent to the proposed mine-disturbance area to reduce effects of livestock on vegetation and stream banks. Sites include springs at the following locations; o NE¼Section 28, Township 32 North, Range 53 East; o SW¼NW¼, Section 27, Township 32 North, Range 53 East; and o NE¼SE¼, Section 27, Township 32 North, Range 53 East. Control weeds at Emigrant Spring enclosure.
Fisheries/Aquatic [1]Lahontan speckled dace, Lahontan redside shiner, Lahontan mountain sucker Tahoe sucker Tui chub Smallmouth bass Brown trout Rainbow/cutthroat hybrids Cutthroat trout (hatchery stock) Rainbow trout	Stream channel diversion; Water quality – Emigrant drainage, Dixie Creek, and South Fork Humboldt River; Loss of 0.15 acre stream channel habitat where the diversion channel would be constructed.	**Monitoring** Prepare a water quality monitoring plan with contingencies including implementation of additional BMPs to control sediment as needed; Monitor surface water flow and quality in drainage channels in the vicinity of the Project Area, including Dixie Creek and possibly South Fork Humboldt River; Monitor groundwater quality in the vicinity of the mine pit, waste rock disposal facility, and heap leach facility for constituents of concern; and Monitor depth to groundwater in the production wells and piezometers located in Dixie Creek Valley.

TABLE 2-6 (continued)
Potential Impacts and Mitigation/Monitoring Measures
Emigrant Project

Resource	Impacts	Recommended Mitigation/Monitoring
Fisheries/Aquatic (continued)		**Mitigation** Provide a natural design for the new diversion channel (to include roughness features, step pools, and substrates for vegetation establishment as applicable) through the proposed mine pit area to allow establishment of aquatic life; Reconstruct/maintain Emigrant Spring enclosure for benefit of fish; Install culverts in a manner to not preclude passage of aquatic life within engineering constraints; and Review status of native fish and macroinvertebrate populations in Emigrant drainage and reconstructed diversion channel every 5 years. Re-establish fish and macroinvertebrate populations into the channel as necessary or warranted.
Wildlife Resources Mule deer, pronghorn, sage grouse (sensitive), other mammal and bird species.	Loss of 1,413 acres upland habitat until reclamation is successful and vegetation is matured to provide for forage and cover similar to pre-mining condition; Loss of nesting/brood rearing/foraging habitat; Loss of 0.15 acre wetlands/riparian areas; Human disturbance (powerlines, roads, facilities, noise, etc).	Provide a natural design for the new diversion channel (to include roughness features, step pools, and substrates for vegetation establishment as applicable) through the proposed mine pit area to allow establishment of aquatic life; Construct four game guzzlers; and Fence wetlands and riparian areas adjacent to the proposed mine-disturbance area to reduce effects of livestock on vegetation and streambanks. Sites include springs at the following locations; o NE¼Section 28, Township 32 North, Range 53 East; o SW¼NW¼, Section 27, Township 32 North, Range 53 East; and NE¼SE¼, Section 27, Township 32 North, Range 53 East.
Sensitive Bats Western Red Bat Pallid Bat Big Brown Bat W. Small-footed Bat Hoary Bat W. Long-eared Myotis Long-legged Myotis	Loss of foraging/ roosting habitat (cliffs, rock crevasses, juniper, wetlands); Loss of riparian/wetlands; Stream channel diversion; Water quality.	Purchase two Anabat recording devices and three night shot cameras. Construct rock piles and drill or blast holes for bat roosting in highwalls and other rock faces; Provide a natural design for the new diversion channel (to include roughness features, step pools, and substrates for vegetation establishment as applicable) through the proposed mine pit area to allow establishment of aquatic life; Fence wetlands and riparian areas adjacent to the proposed mine-disturbance area to reduce effects of livestock on vegetation and streambanks. Sites include springs at the following locations; o NE¼Section 28, Township 32 North, Range 53 East; o SW¼NW¼, Section 27, Township 32 North, Range 53 East; and o NE¼SE¼, Section 27, Township 32 North, Range 53 East. Reconstruct/maintain Emigrant Spring enclosure for benefit of wildlife; and Implement reclamation measures that favor establishment of big sagebrush on portions of the site. Special measures would be coordinated with BLM and NDOW to control soil loss associated with big sagebrush planting.
Recreation	Loss of hunting opportunities; Loss of access.	Install four game guzzlers; and Install five interpretive signs at South Fork Canyon Special Recreation Management Area.

TABLE 2-6 (continued)
Potential Impacts and Mitigation/Monitoring Measures
Emigrant Project

Resource	Impacts	Recommended Mitigation/Monitoring
Grazing Management	Loss of 285 Animal Unit Months (AUMs); Loss of grazing land until reclamation is successful.	Construct trough and pipeline system on east side; Develop two springs within the Project Area and pipe the water outside the enclosure fence; and Develop spring/spring complexes proposed for fencing in wildlife/fisheries sections (Sections 27 and 28, Township 32N, Range 53 E) to provide water for livestock if feasible; and Maintain east side cattle corridor.
Access and Land Use	Loss of hunting opportunities; Loss of access Loss of 285 Animal Unit Months (AUMs); Loss of grazing land until reclamation is successful.	Fence wetlands and riparian areas within and adjacent to the proposed mine-disturbance area to reduce effects of livestock on vegetation and streambanks. Construct spring boxes and water troughs if warranted. Sites include springs at the following locations: o NE¼Section 28, Township 32 North, Range 53 East o SW¼NW¼, Section 27, Township 32 North, Range 53 East o NE¼SE¼, Section 27, Township 32 North, Range 53 East. Construct water trough and pipeline system on east side of Project Area. Maintain east side cattle corridor.
Cultural	Loss of three eligible sites.	Unless otherwise authorized by BLM, no surface disturbance shall occur within or immediately adjacent to (within 100 feet) the boundary of sites CrNV-01-13259, -13261, or –13272 prior to completion of the field phase of the data recovery plan reviewed and approved by BLM and the Nevada State Historic Preservation Office.

[1]Fish species present in the South Fork Humbolt River

CHAPTER 3

AFFECTED ENVIRONMENT FOR PROPOSED ACTION

INTRODUCTION

Existing resources in the Emigrant Project Area are described in this chapter. The Emigrant Project Area is located on public and private land in Elko County, along the east slopes of the Piñon Range approximately ten miles south of the town of Carlin, Nevada. The general area is characterized by steep hills and ephemeral and intermittent drainages within the Dixie Creek watershed. Elevations in the Project Area range from 5,700 feet to over 7,400 feet above mean sea level (amsl).

Study Area boundaries were developed for each resource area and are described in the respective resource sections of this chapter. Study Areas for each environmental resource are based on predicted locations of direct and indirect impacts associated with the Proposed Action.

Appendix 5 of BLM NEPA Handbook (H-1790-1) identifies Critical Elements of the Human Environment. The appendix is a list of elements of the human environment subject to requirements specified in statutes or executive orders and must be considered in all BLM Environmental Assessments (EAs) and Environmental Impact Statements (EISs).

The following Critical Elements of the Human Environment have been analyzed by BLM and would not be affected by the Proposed Action or alternatives, or are not present in the proposed Project Area:

- Areas of Critical Environmental Concern
- Floodplains
- Wild and Scenic Rivers
- Wilderness
- Farmland (prime or unique)

This chapter provides a summary of environmental baseline information. In the following sections, "Project Area" refers to land included within the permit boundary associated with the Proposed Action and adjacent areas.

GEOLOGY, MINERALS, AND PALEONTOLOGY

A description of regional geology and gold mineralization in northern Nevada is presented in Chapter 2, *History of Exploration and Mining*. This section of Chapter 3 provides a description of geology in the Emigrant Project Area and surrounding areas.

The Project Area is located within the Basin and Range Physiographic Province, a region that extends over most of Nevada and parts of adjoining states. Range-front faulting in the province has created north-south trending fault-block mountain ranges separated by broad valleys filled with alluvium. The Emigrant deposit is located near Emigrant Spring at the northern end of the Piñon Range. The range is comprised of Ordovician through Permian shale, siltstone, limestone and conglomerate. Deposition of this sequence of rocks was

interrupted by the Antler Orogeny (a major mountain building event).

Northeastern Nevada was situated along a stable paleo-continental margin during much of the Cambrian through Early Mississippian. During this period, a westward thickening, prism-shaped package of sediment was deposited into an adjacent oceanic basin. Within this depositional environment, sedimentary facies graded from predominantly carbonate sequences on the east to predominantly siliciclastic sequences to the west. During Late Devonian through Early Mississippian, compressional tectonism associated with the Antler orogeny resulted in east-directed imbricate thrusting of western siliciclastic facies over eastern carbonate facies. The emergent Antler highlands shed clastic sediments to the east followed in time by the deposition of shelf carbonates. Since the time of the Antler orogeny, this package of rocks has been faulted by younger thrust faults and by subsequent high angle faulting. Some of these high angle faults structurally prepared the ground and acted as conduits that localized deposition of ore (Thompson *et al.* 2002; Trexler *et al.* 2004; Lapointe *et al.* 1991).

Figure 3-1 is a geologic map of the Emigrant Project Area and a simplified stratigraphic section is presented in **Figure 3-2**. The Emigrant gold deposits are contained within siltstone, shale, and sandstone of the Lower Mississippian Webb Formation, which is the basal unit of the western facies sequence of sediment (Thoreson 1991). Gold occurs in very shallow west-dipping tabular bodies at the contact of the lower Mississippian Webb Formation (siltstone) and unconformably underlying Devonian Devils Gate Limestone (**Figure 3-3**).

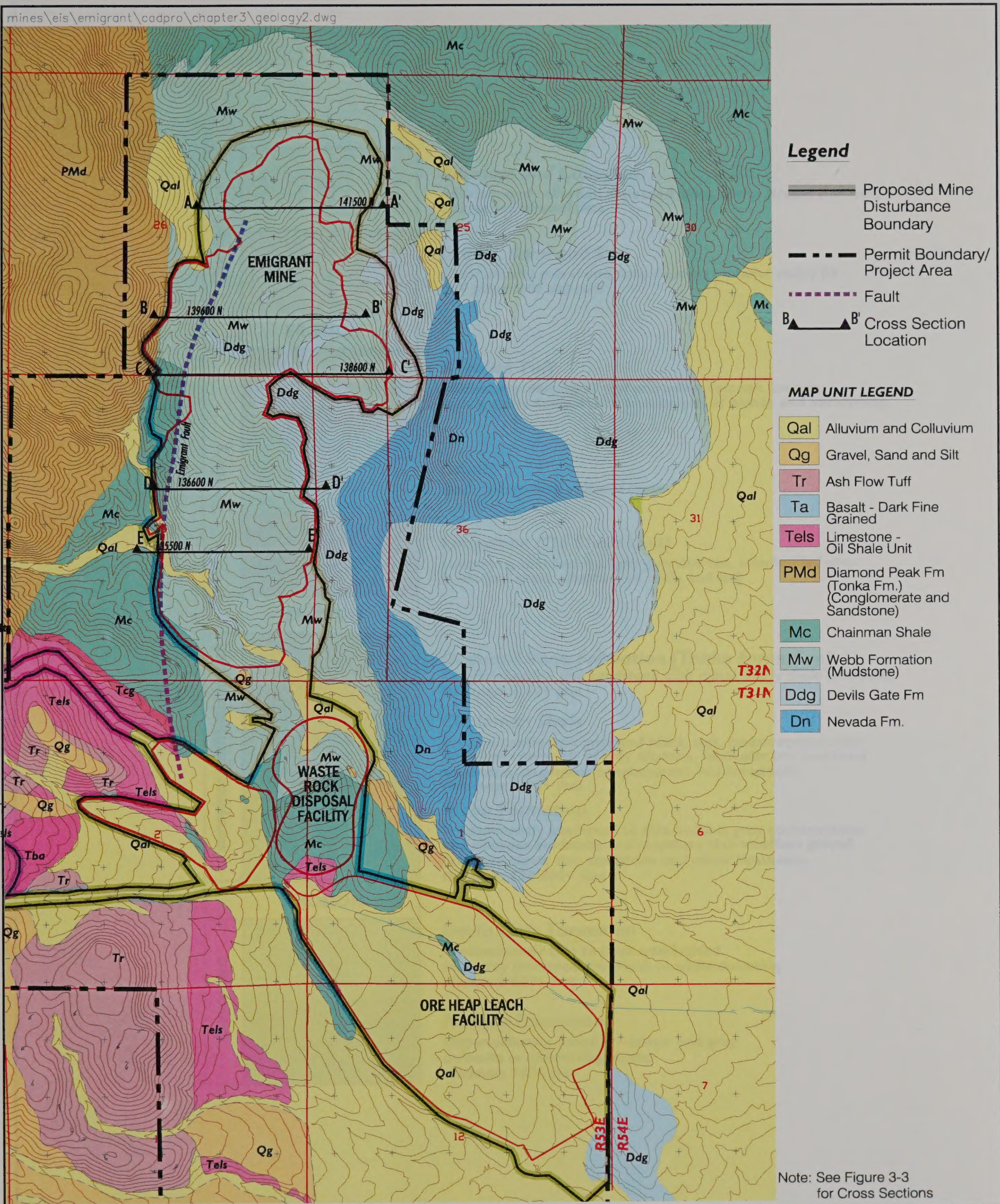
The Emigrant Fault occurs along the western margin of the Emigrant gold deposit. The fault strikes N10E, dips 80-85 degrees west, and has jasperoidial quartz and barite deposits along much of its trend. Gold mineralization is present at the surface. The fault juxtaposes the Mississippian Chainman Formation in the hanging wall (above the fault plane) of the fault with the Webb Formation and the Devils Gate Limestone in the footwall (below the fault plane) (**Figure 3-3**) (Thoreson 1991; Lapointe *et al.* 1991). Although mineralization commonly occurs adjacent to the fault, elsewhere it lies as much as 3,000 feet east of the Emigrant fault. The fault is thought to be a localizing structure for hydrothermal fluids that migrated up the fault and outward into adjacent sediment to form disseminated low-grade gold deposits within favorable sedimentary horizons. Mineralization extends 12,000 feet along a north-south trend parallel to the fault, and mineralization thins to the east away from the fault.

In the vicinity of the ore deposits, siltstone and sandstone of the Webb Formation are argillaceous, fractured, silicified, bleached, and iron oxide stained (Bentz *et al.* 1983). Most of the ore proposed for mining is completely oxidized with pyrite converted to limonite and hematite.

AREA SEISMICITY

The Basin and Range Province is an area of moderately high rates of seismic activity and contains three zones of significantly higher rates of activity within Nevada. The Emigrant Project Area occurs about 90 miles east of the Nevada Seismic Zone, the nearest of these three zones.

No work has been undertaken to establish recent movement on fault structures in the Emigrant Project Area. Although, many of the high-angle faults shown on the Emigrant area geologic map (**Figure 3-1**) could be considered geologically active, most have very long recurrence intervals where the return period of seismic activity is on the order of thousands of years (most recent movement typically within Quaternary period). Recent work by the U. S. Geological Survey (USGS) in 2000-2001 has



Data Source: Newmont, 2005

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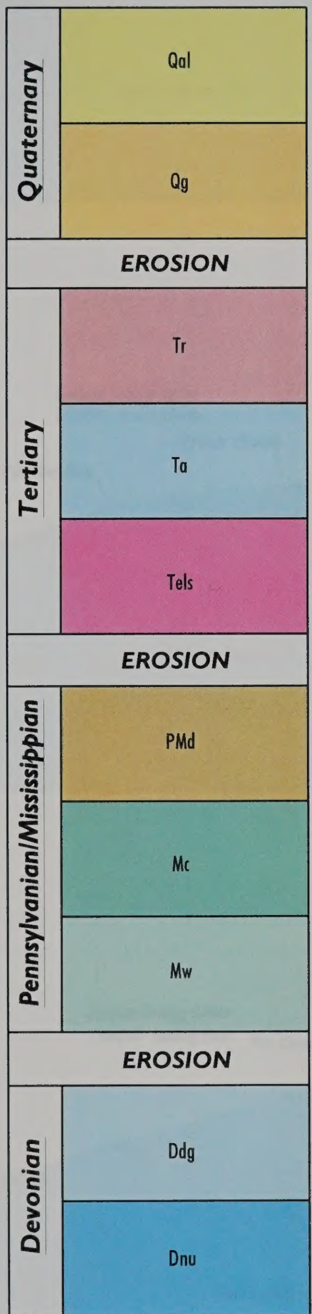
Contour Interval = 20'

Geologic Map
Emigrant Mine Project
Elko County, Nevada
FIGURE 3-1



Alluvium and Colluvium
Alluvium and colluvium deposited along active stream channels, valleys and alluvial fans

Gravel, Sand and Silt
Older alluvial gravel and sand deposits as major valley fill and playa lake deposits

Rhyolite Tuff
Massive rhyolitic lapilli tuff and minor volcanic breccia, locally glassy texture with phenocrysts of biotite and hornblende

Basalt
Dark fine grained volcanic rocks

Limestone (Oil Shale Unit)
Limestone, thin bedded light gray and tan, interbedded with laminated shale, siltstone, oil shale and tuff

Diamond Peak Formation (Tonka Formation)
Conglomeration and sandstone with minor marly shale interbeds; thickness 4700+ feet

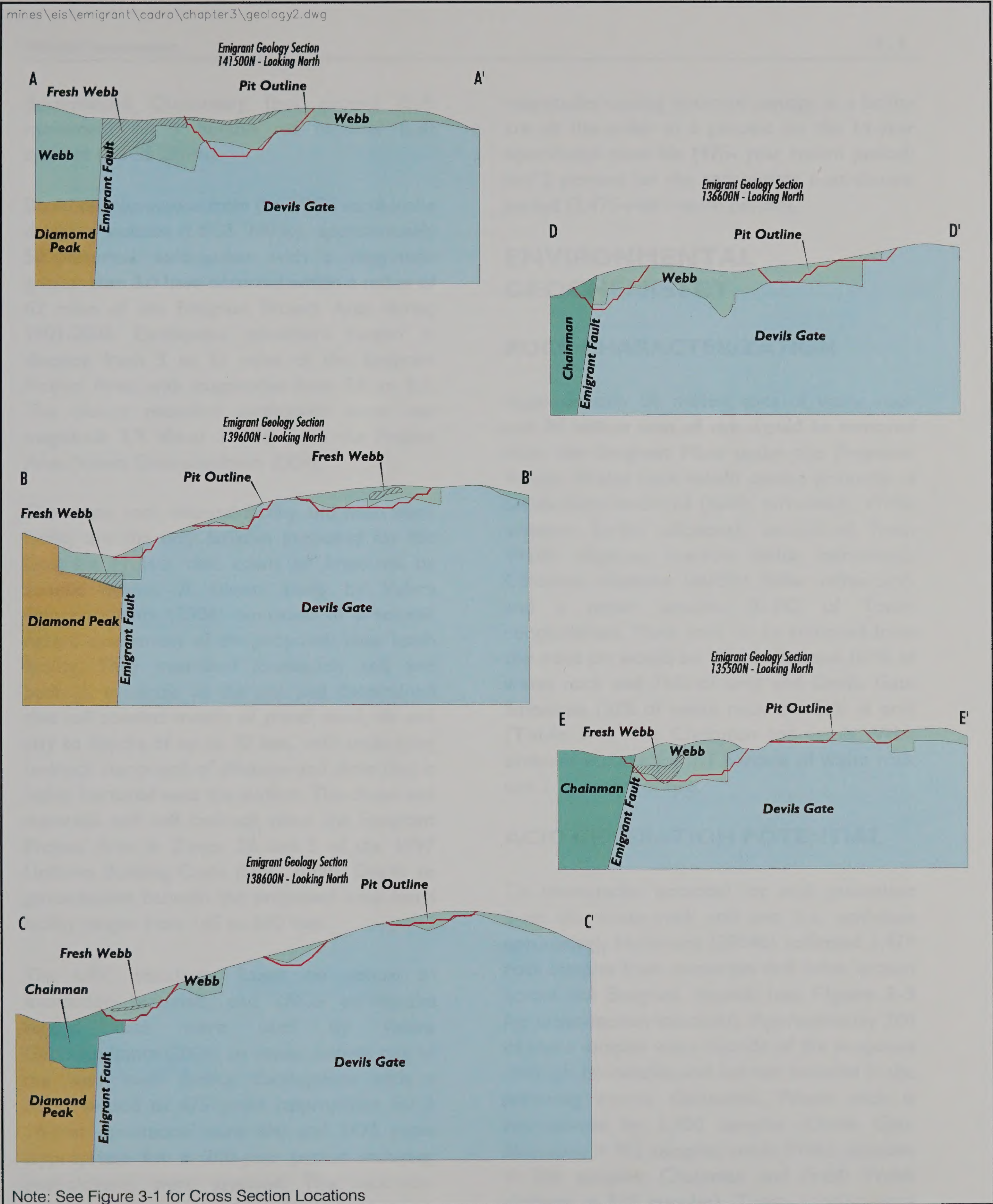
Chainman Shale
Predominantly light gray and black, soft, carbonaceous shale with lesser amounts of gray siltstone, lenticular tan quartzose sandstone, and minor conglomerate and limestone; thickness 1600+ feet

Webb Formation
Predominantly laminated to thin-bedded, gray carbonaceous and siliceous mudstone and claystone that weathers grayish brown to black, thin sandstone and minor limestone; thickness 730-800+ feet

Devils Gate Formation
Predominantly thin to thick interbedded blue-gray limestone and black to white dolomite; thickness 800+ feet

Nevada Formation
Upper dolomite member - brown and gray dolomite in alternating layers; thickness 940+ feet

Geologic Stratigraphic Section
Emigrant Mine Project
Elko County, Nevada
FIGURE 3-2



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Geologic Cross Sections
Emigrant Mine Project
Elko County, Nevada
FIGURE 3-3

documented Quaternary (not recent) fault movement on a number of regional fault systems (USGS 2004a).

Based on information from the USGS earthquake database website (USGS 2004b), approximately 50 historical earthquakes with a magnitude greater than 3.0 have occurred within a radius of 62 miles of the Emigrant Project Area during 1901-2003. Earthquake epicenters ranged in distance from 3 to 61 miles of the Emigrant Project Area, with magnitudes from 3.0 to 5.1. The closest recorded earthquake event was magnitude 3.9, about 3 miles from the Project Area (Valera Geoconsultants 2004).

The waste rock disposal facility and heap leach facility are the only facilities proposed for the Emigrant Project that could be impacted by seismic events. A recent study by Valera Geoconsultants (2004) consisted of a seismic hazard assessment of the proposed heap leach facility. They examined foundation soil and bedrock materials at the site and determined that soil consists mostly of gravel, sand, silt and clay to depths of up to 30 feet, with underlying bedrock composed of siltstone and shale that is highly fractured near the surface. The dense soil materials and soft bedrock place the Emigrant Project Area in Zones 2B and 3 of the 1997 Uniform Building Code (UBC 2000). Depth to groundwater beneath the proposed heap leach facility ranges from 145 to 630 feet.

The UBC standards, based on nature of foundation materials, and USGS earthquake record data were used by Valera Geoconsultants (2004) to assess seismic risk of the heap leach facility. Earthquakes with a return-period of 475 years (appropriate for a 14-year operational mine life) and 2475 years (appropriate for a 200-year period including post-closure) were assessed. The maximum credible earthquake used for the evaluation was a magnitude 6.1 occurring at distances ranging from 10 to 17.4 miles from the site. The probability of earthquakes occurring that have magnitudes causing potential damage to a facility are on the order of 3 percent for the 14-year operational mine life (475- year return period) and 2 percent for the appropriate post-closure period (2,475-year return period).

ENVIRONMENTAL GEOCHEMISTRY

ROCK CHARACTERIZATION

Approximately 86 million tons of waste rock and 94 million tons of ore would be removed from the Emigrant Mine under the Proposed Action. Waste rock would consist primarily of Devils Gate limestone (oxide carbonate), Webb siltstone (oxide siliceous), unoxidized Fresh Webb siltstone (carbon sulfur refractory), Chainman siltstone (carbon sulfur refractory), and a minor amount (0.1%) of Tonka conglomerate. Most rock to be removed from the mine pit would be Webb siltstone (67% of waste rock and 76% of ore) and Devils Gate limestone (32% of waste rock and 21% of ore) (**Table 3-1**). The Chainman and Fresh Webb siltstone account for 1.1 percent of waste rock and 2.5 percent of ore.

ACID GENERATION POTENTIAL

To characterize potential for acid generation from the waste rock and ore (i.e., acid-base accounting), Newmont (2004b) collected 1,470 rock samples from numerous drill holes located across the Emigrant deposit (see **Figure 3-3** for cross-section locations). Approximately 200 of these samples were outside of the proposed mine pit boundaries and are not included in the following results discussion. Waste rock is represented by 1,100 samples (Devils Gate limestone = 452 samples; oxide Webb siltstone = 330 samples; Chainman and Fresh Webb siltstone = 318 samples). Tonka conglomerate was not subject to acid-base account testing. Ore rock is represented by 172 samples (Devils Gate limestone = 37 samples; oxide Webb

TABLE 3-1
Proposed Waste Rock and Ore Production
Emigrant Project

Sample Type	Formation	Tons Produced (Life of Mine)	% of Total Waste/ Ore	Number of ABA Samples
Carbon Sulfur Refractory (CSR) Waste Rock	Chainman/Fresh Webb	943,022	1.1	318
Oxide Carbonate (OC)	Devils Gate Limestone	27,176,184	31.7	452
Oxide Siliceous (OS)	Webb Siltstone	57,610,080	67.2	330
Total Waste Rock		**85,729,286**	**100.0**	**1,100**
Carbon Sulfur Refractory (CSR) Ore	Chainman/Fresh Webb	2,350,670	2.5	30
Oxide Carbonate (OC)	Devils Gate Limestone	19,839,655	21.1	37
Oxide Siliceous (OS)	Webb Siltstone	71,836,477	76.4	105
Total Ore		**94,026,802**	**100.0**	**172**

Source: Newmont. 2005c. Spreadsheet reporting LECO data for waste and ore samples within current Emigrant Plan of Operations pit design. EMG lecos in pit no FA1_012605.xls
Note: ABA = acid-base account testing.

siltstone = 105 samples; Chainman and Fresh Webb siltstone = 30 samples). Each of the waste rock and ore samples was subjected to laboratory analysis of carbon fractions (total, organic, and carbonate carbon) and sulfur fractions (total, sulfate, and sulfide sulfur). From these results presented in **Table 3-2**, the following values were calculated:

- Neutralization Potential (NP), expressed as $\%CO_2$.
- Acidification Potential (AP), expressed as $\%CO_2$.
- Net Carbonate Value (NCV), expressed as $\%CO_2$.
- Net Neutralization Potential (NNP), expressed as tons $CaCO_3$ per kiloton rock.

The BLM (1996) uses NP:AP ratios and NNP values to evaluate potential for rock to generate acid. Rock is assumed to be potentially acid generating (PAG) if NP:AP ≤1.0 and NNP ≤20 tons $CaCO_3$ per kiloton (tons/kton) rock material. Rock will not be considered PAG if NP:AP ≥3.0 and NNP ≥20 tons/kton. For samples having NP:AP between 1.0 and 3.0, and/or NNP between -20 and +20 tons/kton, kinetic tests are used to determine if the rock has potential to generate acid.

The NP:AP ratios and NNP values for the Emigrant deposit rock samples (**Table 3-2**) show that Devils Gate limestone (32% of waste rock and 21% of ore) presents no risk of acid generation (average NP:AP = 221 for waste rock and 426 for ore; average NNP = 482 tons/kton for waste rock and 351 tons/kton for ore). Samples of Chainman and Fresh Webb siltstone (1.1% of waste rock and 2.5% of ore)

TABLE 3-2
Proposed Waste Rock/Ore
Mean Acid-Base Accounting Data
Emigrant Project

Formation	Mean Total Carbon %	Mean Organic Carbon %	Mean Carbonate Carbon %	Mean Total Sulfur %	Mean Sulfate Sulfur %	Mean Sulfide Sulfur %	Mean NP[1] % CO_2	Mean AP[1] % CO_2	Mean NP : AP	Mean Net Carbonate Value (NCV) % CO_2	Net Neutralization Potential (NNP) tons / kton $CaCO_3$			
											Min	Mean	Max	Std. Dev.
Waste Rock Samples														
Chainman/Fresh Webb	0.6698	0.6435	0.0263	1.3359	0.3847	0.9512	0.1	-1.3	0.1	-1.2	-97.29	-27.39	-2.38	21.96
Devils Gate Limestone	5.9714	0.1604	5.8111	0.2989	0.2284	0.0705	21.3	-0.1	220.8	21.2	2.11	481.92	982.71	344.65
Webb Siltstone	0.2317	0.1917	0.0400	0.3338	0.3152	0.0186	0.1	0.0	5.8	0.1	-2.04	2.75	16.33	4.11
Run-of-Mine Waste Rock[2]									70.5	6.4		146.44		
Ore Samples														
Chainman/Fresh Webb	0.3269	0.3204	0.0065	1.4451	0.8642	0.5809	0.0	-0.8	0.0	-0.8	-56.10	-17.52	-2.33	14.35
Devils Gate Limestone	4.3357	0.1090	4.2267	0.4063	0.3797	0.0266	15.5	0.0	425.7	15.5	16.82	351.29	932.59	311.02
Webb Siltstone	0.1831	0.1399	0.0432	0.7577	0.7376	0.0201	0.2	0.0	5.8	0.1	-2.25	2.97	16.36	4.79
Run-of-Mine Ore[2]									85.6	3.0		69.22		

[1] NP = neutralization potential; AP = acidification potential.
[2] Run-of-mine averages based on tonnages reported in **Table 3-1**.
Note: Carbon and sulfur fractions were analyzed by laboratory for each rock sample; NP, AP, NCV, and NNV values are calculated.
Source: Newmont 2005c. Spreadsheet reporting LECO data for waste rock and ore samples within current Emigrant pit design. EMG lecos in pit no FA1_012605.xls.

show these rock types are likely to generate acid (average NP:AP = 0.1 for waste rock and 0.0 for ore; average NNP = -27 tons/kton for waste rock and -17 tons/kton for ore). On average, oxide siliceous Webb siltstone (67% of waste rock and 76% of ore) samples show an unlikely potential to generate acid (average NP:AP = 6 for both waste rock and ore; average NNP = 3 tons/kton for both waste rock and ore).

Run-of-mine averages calculated for waste rock and ore, based on percentage of each lithology relative to total rock volume as shown in **Table 3-1** and assuming complete mixing, indicate that both waste rock and ore would be non-PAG (average NP:AP = 71 for waste rock and 86 for ore; average NNP = 146 tons/kton for waste rock and 69 tons/kton for ore) (**Table 3-2**).

In addition to using NP:AP and NNP values based on BLM (1996) guidance, Newmont considers NCV data for evaluation of potential for rock to generate acid using the following criteria obtained from the document, "*Newmont Standard Waste Rock Evaluation Methods – Protocol for NCV Classification Studies*":

Classification	Criteria for Classification
Highly Acidic (HA)	NCV ≤ -5
Acidic (A)	-5 < NCV ≤ -1
Slightly Acidic (SA)	-1 < NCV ≤ -0.1
Neutral (N)	-0.1 < NCV < 0.1 and (NP ≥ 0.1or AP ≤ -0.1)
Inert (I)	-0.1< NCV < 0.1 and (NP < 0.1or AP > -0.1)
Slightly Basic (SB)	0.1 ≤ NCV < 1
Basic (B)	1 ≤ NCV < 5
Highly Basic (HB)	NCV ≥ 5

These criteria were developed to address samples showing little or no acidification and neutralization potential during NP:AP testing. Such samples can have NP:AP and NNP values that suggest show potential for acid generation, despite an absence of acid-generating sulfide minerals. Results of the NCV analyses in **Table 3-2** show that the Devils Gate limestone is highly basic (NCV = 21% CO_2 for waste rock and 16% CO_2 for ore), Chainman and Fresh Webb siltstone are slightly acidic to acidic (NCV = -1.2% CO_2 for waste rock), and oxide Webb siltstone is inert, slightly basic, and basic (NCV = 0.1% CO_2 for both waste rock and ore). **Figure 3-4** shows the breakdown of waste rock and ore volumes according to NCV classification. Approximately 88 percent of waste rock and 85 percent of ore are in one of the basic NCV categories (slightly basic, basic, or highly basic). In addition, approximately 11 percent of waste rock and 12 percent of ore are in the neutral-inert NCV categories.

NCV testing does not measure reactivity of rock material. Therefore to confirm the NCV results, Newmont will conduct additional kinetic testing, primarily using oxidized Webb siltstone component of waste rock and ore. Kinetic testing, performed by an independent laboratory, will verify NCV data and allow corrections for any false positive data. Rock samples will be collected using a NCV grid that includes tonnages of each NCV classification for the proposed mine pit area. The NCV sampling grid will be used to ensure adequate spatial representation of rock types that would be encountered over the life-of-mine. Newmont will provide these data for the BLM and NDEP to complete their analysis prior to issuance of the Record of Decision.

METAL MOBILITY

The Meteoric Water Mobility Procedure (MWMP) was used to estimate potential trace element release for six monolithologic composite samples, two each, for the three operational rock types: Devils Gate limestone (oxide carbonate), Webb siltstone (oxide siliceous), and Chainman and Fresh Webb siltstone (carbon sulfur refractory) (Newmont 2004a; SVL Analytical 1995). Results of these analyses are presented in **Table 3-3**. Drill-hole identifications and depth intervals from which specific sub-samples were collected and composited are reported by Newmont (1995, 2002). In **Table 3-3**, carbon sulfur waste rock sample is representative of the 1.1 percent PAG waste rock identified in the current pit design.

Samples tested during the 1995 program were composited to represent the spatial distribution of each rock type based on exploration drilling and pit geometry at that time. This drilling program was concentrated in what is now the southern portion of the proposed mine pit. For comparison purposes, drinking water standards for arsenic and antimony were exceeded in MWMP extract from five of the seven composite waste rock samples. Standards for cadmium, lead, manganese, nickel, selenium, thallium, zinc, and pH were also exceeded for this sample. The four composite samples representing oxide carbonate and oxide siliceous waste rock produced MWMP extract concentrations that did not exceed drinking water standards for all parameters, except arsenic and antimony, and in most cases were below laboratory detection limits.

The sample representing a run-of-mine waste rock mixture also was subjected to MWMP testing in 1997 (**Table 3-3**). Like the 1995 samples, run-of-mine sample was composited based on a preliminary mine plan and contained a greater percentage of oxide siliceous Webb siltstone (82%) and carbon sulfur Chainman/

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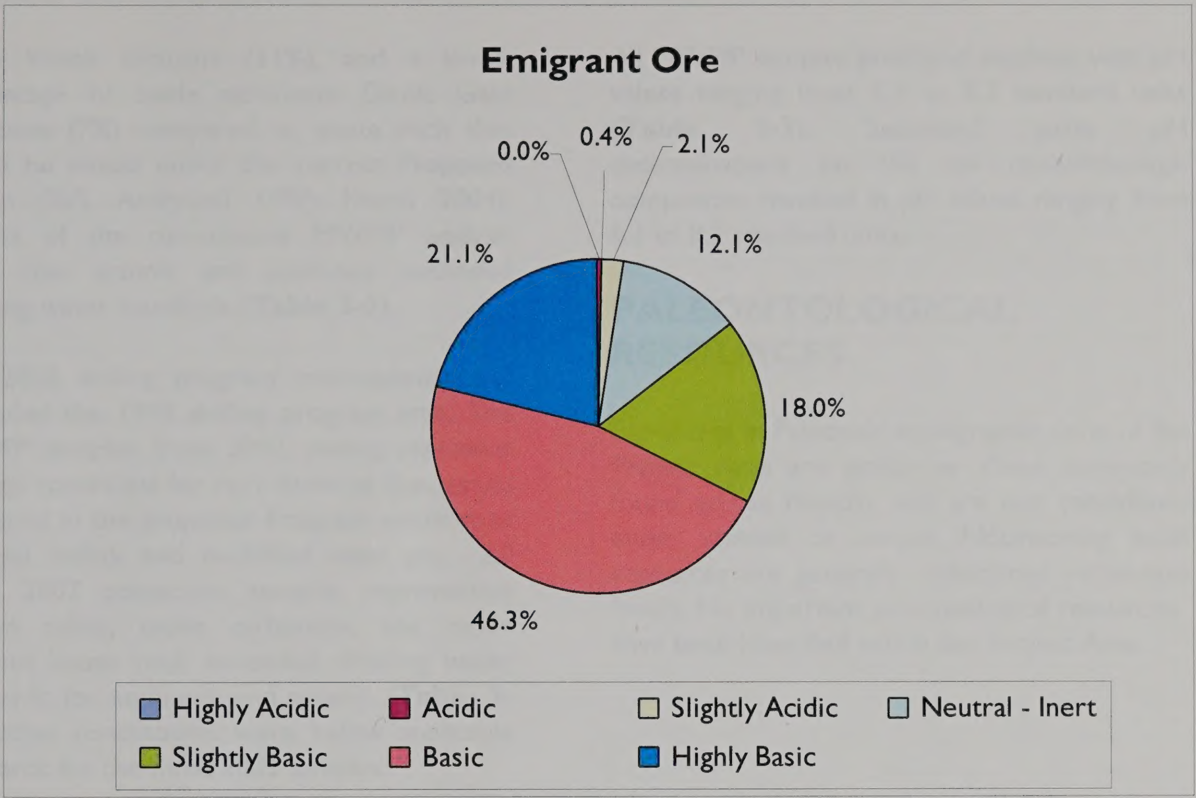
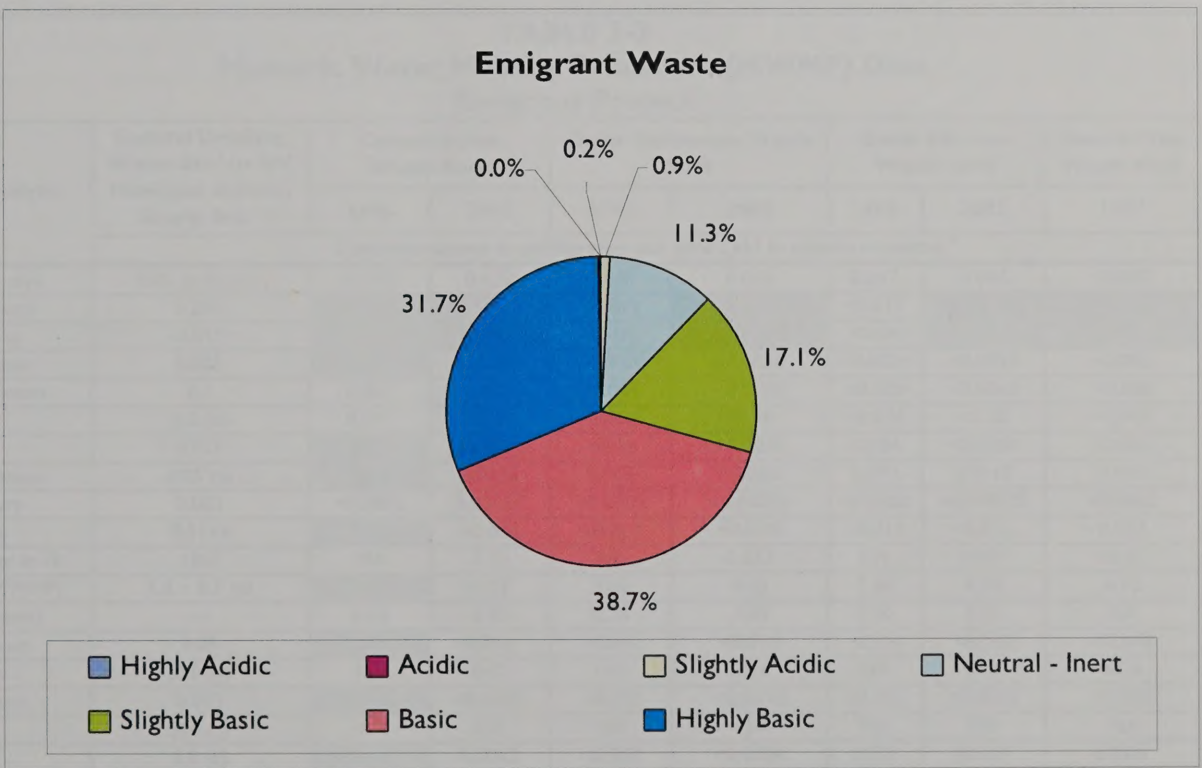




Pie Chart of Net Carbonate Value
for Waste Rock and Ore
Emigrant Mine Project
Elko County, Nevada
FIGURE 3-4

Fresh Webb siltstone (11%), and a lower percentage of oxide carbonate Devils Gate limestone (7%) compared to waste rock that would be mined under the current Proposed Action (SVL Analytical 1997; Harris 2004). Results of the run-of-mine MWMP analysis show that arsenic and antimony exceeded drinking water standards (**Table 3-3**).

The 2002 drilling program encompassed and expanded the 1995 drilling program area. The MWMP samples from 2002 testing represent average conditions for rock material that would be placed in the proposed Emigrant waste rock disposal facility and backfilled mine pit. All three 2002 composite samples representing carbon sulfur, oxide carbonate, and oxide siliceous waste rock exceeded drinking water standards for antimony and arsenic (**Table 3-3**). Other constituents were below applicable standards for the three 2002 samples.

All MWMP samples produced leachate with pH values ranging from 6.4 to 8.2 standard units (**Table 3-3**). Saturated paste pH determinations on the six monolithologic composites resulted in pH values ranging from 6.1 to 8.2 standard units.

PALEONTOLOGICAL RESOURCES

Exposures in Paleozoic stratigraphic units of the Project Area are similar to those commonly found across Nevada and are not considered either unusual or unique. Noteworthy fossil resources are generally considered vertebrate fossils. No important paleontological resources have been identified within the Project Area.

TABLE 3-3
Meteoric Water Mobility Procedure (MWMP) Data
Emigrant Project

Analyte	Federal Drinking Water Strd or NV Municipal & Dom. Supply Std. [1]	Carbon Sulfur Waste Rock		Oxide Carbonate Waste Rock		Oxide Siliceous Waste Rock		Run-of-Mine Waste Rock
		1995	2002	1995	2002	1995	2002	1997
	Concentrations in milligrams per liter (pH in standard units) [2]							
Aluminum	0.05 to 0.2 (s)	0.112	0.022	0.040	0.032	0.047	0.066	<0.037
Antimony	0.006	**0.063**	**0.0139**	<0.019	**0.163**	<0.019	**0.0178**	**0.008**
Arsenic	0.01*	**0.06**	**0.026**	<0.04	**0.039**	<0.04	**0.114**	**0.07**
Cadmium	0.005	**0.0050**	<0.0020	<0.0024	<0.0020	<0.0024	<0.0020	<0.002
Chromium	0.1	0.007	<0.0060	<0.005	<0.0060	<0.005	<0.0060	<0.008
Iron	0.3 (s)	0.047	<0.20	<0.024	<0.20	<0.024	<0.20	<0.019
Lead	0.015	**0.05**	<0.0050	<0.04	<0.0050	<0.04	<0.0050	<0.002
Manganese	0.05 (s)	**5.85**	0.0435	0.003	0.0064	0.039	0.0167	0.040
Mercury	0.002	<0.0002	0.00083	<0.0002	<0.00020	<0.0002	<0.00020	<0.0002
Nickel	0.0134	**3.64**	<0.010	<0.017	<0.010	<0.017	<0.010	0.027
Nitrate as N	10.0	NA	1.13	NA	0.333	NA	0.651	<0.05
pH (MWMP)	6.5 – 8.5 (s)	**6.39**	8.03	7.68	8.02	7.44	8.20	8.12
pH (Paste)	---	6.05	6.95	8.24	7.80	7.50	7.70	NA
Selenium	0.05	**0.10**	0.014	<0.04	<0.010	<0.04	<0.010	<0.048
Sulfate	250 (s)	NA	84.2	NA	25.4	NA	97.7	61.6
Thallium	0.002	**0.232**	<0.0010	<0.073	<0.0010	<0.073	<0.0010	<0.001
TDS[3]	500 (s)	NA	357	NA	159	NA	390	NA
Zinc	5.0 (s)	**5.16**	0.0063	<0.002	<0.0050	0.023	0.0127	0.006

Source: Newmont 2004b.

[1] Lowest concentration shown between Federal standards (40 CFR Parts 141 & 143) and State standards (Nevada Administrative Code 445A.119 and 144); (s) = secondary standard. See **Table A-1** in **Appendix A**. * = current standard for arsenic is 0.05 mg/l until January 2006 when the standard becomes 0.01 mg/l.

[2] Bold and shaded value exceeds drinking water standard; NA = not analyzed.

[3] TDS = total dissolved solids.

AIR QUALITY

METEOROLOGY

The Emigrant Project Area is subject to large daily temperature fluctuations, low relative humidity, and limited cloud cover. Wind data were collected at Newmont's Rain Mine, located adjacent to the Emigrant Project Area, from April 1993 through December 2003. The data indicate the most common wind direction is from the south-southeast and southeast, with an average wind speed of 8.2 miles per hour.

The Emigrant Project Area is at an elevation of approximately 6,000 feet amsl. Spring Canyon Mountain rises to 7,200 feet amsl, approximately two miles north of the site, oriented at a northwest to southeast direction. The elevated location of the site influences wind, precipitation, and temperature. After sunset, cool mountain airflow is down slope across the Project Area. Temperatures increase after sunrise, as warm valley air rises up slope until midday, when ground heating causes instability and variable wind directions.

TEMPERATURE AND PRECIPITATION

General meteorological conditions in the area are best represented by data collected at the Emigrant site. Because the period of record for this location is only ten years, data recorded by the National Weather Service at Rand Ranch Palisade, Pine Valley Bailey Ranch, Jiggs, Jiggs 8 SSE Zaga, and Ruby Lake and the Newmont Carlin mine are also presented. These sites provide information for sites over a range of elevations in the region of the Project Area. Average monthly temperature and precipitation data from these sites provide a description of general weather patterns in the region as shown in **Table 3-4**.

BLM has three weather stations located near the project. Two on Dixie Creek, operational from 2000-2002, and one at Crane Springs, located southeast of the Project Area. The Crane Springs station has been operating continuously since 1997.

Mean monthly temperatures recorded at the Rand Ranch Palisade, Pine Valley Bailey Ranch, Jiggs, Jiggs 8 SSE Zaga, and Ruby Lake meteorological stations vary from 63° to 69° Fahrenheit (F) in July and August to 24° to 28° F in December and January. The 1966 to 2002 Carlin Mine and 1993-1997 Emigrant Mine temperature data are slightly higher, ranging from 71° F in July and August to 27° F in December and January, but consistent with those recorded from the five National Weather Service stations. Monthly mean minimum and maximum daily temperature values from the mine sites demonstrate that the range of temperatures within a month vary by an average of 20° F and 17° F, while the range of temperatures within a month at the NWS sites vary by an average of 34.5° F.

Precipitation measured at the NWS meteorological stations and the mine sites show similar trends, with heaviest precipitation falling from November through January as snow, and March through June as rain. Summer precipitation occurs mostly as scattered showers and thunderstorms that contribute relatively little to overall precipitation. Average annual precipitation in the Emigrant Mine area is 12.0 inches.

AIR QUALITY

The State of Nevada and federal government have established ambient air quality standards for criteria air pollutants. Criteria pollutants are carbon monoxide (CO), lead (Pb), sulfur dioxide (SO_2), particulate matter smaller than 10 microns (PM_{10}), particulate matter smaller than 2.5 microns ($PM_{2.5}$), ozone, and nitrogen dioxide (NO_2).

TABLE 3-4
Emigrant Project Area Temperature and Precipitation

Meteorological Station	Elevation (feet)	Period of Record		Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Ann.
Average Maximum, Average Minimum, and Mean Temperature (degrees Fahrenheit)																
Newmont Emigrant Mine[1]	6,000	4/93-12/03	Max	38	41	42	49	59	67	79	75	65	56	44	33	54
			Min	26	28	34	38	46	51	64	66	59	45	27	26	43
Newmont Carlin Mine[2]	6,530	1966-2002	Max	34	38	45	52	62	72	83	83	72	59	43	35	57
			Min	20	23	27	31	40	49	58	58	48	38	27	20	37
			Mean	27	31	35	41	51	61	71	71	60	49	35	27	47
Rand Ranch Palisades[2]	5,050	1956-1982	Max	39	45	51	59	69	78	89	86	77	66	51	41	63
			Min	9.3	17	20	24	30	37	40	39	30	22	18	10	25
			Mean	24	31	36	41	50	58	65	63	54	44	34	25	44
Pine Valley Bailey Ranch[2]	5,050	1982-2004	Max	39	44	54	61	70	82	91	89	79	67	49	40	64
			Min	12	15	24	26	33	37	41	40	32	23	16	12	26
			Mean	26	29	39	43	51	60	66	65	55	45	33	25	45
Jiggs[2]	5,450	1948-1972	Max	39	43	50	58	68	77	89	87	78	67	51	39	62
			Min	11	15	19	25	33	39	43	41	32	23	19	11	26
			Mean	25	29	34	42	50	58	66	64	55	45	35	25	44
Jiggs 8 SSE Zaga[2]	5,800	1978-2004	Max	37	41	49	57	66	76	85	84	75	63	47	38	60
			Min	14	16	23	28	35	41	47	46	38	29	20	14	29
			Mean	25	28	36	43	50	58	66	65	56	46	34	26	45
Ruby Lake[2]	6,010	1948-2004	Max	39	43	49	58	67	78	87	86	77	65	50	41	62
			Min	14	18	24	31	38	45	52	50	41	31	23	15	32
			Mean	27	31	37	44	53	61	69	68	59	48	36	28	47
Mean Monthly Precipitation (inches)																
Emigrant Mine	6,000	4/93-12/03	Mean	0.86	0.66	0.98	2.0	2.0	0.63	0.34	0.30	0.64	0.98	0.88	1.8	12.0
Rain Mine[3]	6,600	1/97–10/04	Mean	1.78	1.54	.80	1.79	1.37	0.87	0.41	0.46	0.91	0.97	0.94	1.24	13.08
Crane Springs	6,400	1997-2004	Mean	0.63	0.32	0.34	0.85	0.70	0.63	0.47	0.45	0.59	0.59	0.53	0.14	6.24
Lower Dixie Cr.	5,240	3/00-10/02	Mean	0.31	0.44	0.39	1.17	0.60	0.11	0.24	0.18	0.56	0.79	0.73	0.80	6.32
Upper Dixie Cr.	5,751	4/00-10/02	Mean	0.21	0.26	0.83	0.45	0.70	0.10	0.35	0.15	0.38	0.62	0.78	0.36	5.19
Carlin Mine	6,530	1966-2002	Mean	1.13	0.95	1.23	1.09	1.26	1.10	0.41	0.46	0.96	0.94	1.13	1.43	12.09
Rand Ranch	5,050	1956-1982	Mean	0.90	0.84	0.95	0.92	1.16	1.12	0.37	0.46	0.60	0.76	0.91	1.04	10.03
Pine Valley	5,050	1982-2004	Mean	0.79	0.80	1.07	1.15	1.42	0.83	0.30	0.58	0.86	0.80	1.02	0.88	10.49
Jiggs	5,450	1948-1972	Mean	1.03	0.91	1.03	1.30	1.56	1.07	0.43	0.49	0.54	0.59	0.97	1.23	11.15
Jiggs 8 SSE Zaga	5,800	1978-2004	Mean	1.28	1.08	1.54	1.54	2.08	0.95	0.41	0.65	0.96	0.93	1.22	1.15	13.78
Ruby Lake	6,010	1948-2004	Mean	1.44	1.20	1.31	1.17	1.32	0.85	0.49	0.65	0.77	0.96	1.41	1.45	13.02

Source:
[1] Newmont 2003b.
[2] Western Regional Climate Center 2004a – 2004f.
[3] Newmont 2004d.

Ambient air quality standards must not be exceeded in areas accessible to the general public. **Table 3-5** lists the Nevada and federal primary and secondary air quality standards. National primary standards are the levels of air quality necessary, with an adequate margin of safety, to protect public health. National secondary standards are levels of air quality necessary to protect public welfare from known or anticipated adverse effects of a regulated air pollutant.

TABLE 3-5
State of Nevada and National Ambient Air Quality Standards

Pollutant	Averaging Time	Concentration[1]	Comments
Ozone	1 hour	235 μg/m³ (0.12 ppm)	National Primary Standard[2] & Nevada Standard
	8 hour	157 μg/m³ (0.08 ppm)	National Primary Standard[3] only
Carbon Monoxide, <5,000 feet elevation	8 hours	10,000 μg/m³ (9 ppm)	National Primary Standard[4] & Nevada Standard
Carbon Monoxide, ≥5,000 feet elevation	8 hours	7,000 μg/m³ (6 ppm)	Nevada Standard only; National 8-hour Standard is same for all elevations
Carbon Monoxide, all elevations	1 hour	40,000 μg/m³ ; 40,500 μg/m³ (35 ppm)	National Primary Standard[4] & Nevada Standard
Nitrogen Dioxide	Annual Arithmetic Mean	100 μg/m³ (0.053 ppm)	National Primary Standard & Nevada Standard
Sulfur Dioxide	Annual Arithmetic Mean	80 μg/m³ (0.03 ppm)	National Primary Standard & Nevada Standard
	24 hours	365 μg/m³ (0.14 ppm)	National Primary Standard[4] & Nevada Standard
	3 hours	1,300 μg/m³ (0.5 ppm)	National Secondary Standard[4] & Nevada Std
Particulate Matter as PM_{10}	Annual Arithmetic Mean	50 μg/m³	National Primary Standard[5] & Nevada Standard
	24 hours	150 μg/m³	National Primary Standard[4] & Nevada Standard
Particulate Matter as $PM_{2.5}$	Annual Arithmetic Mean	15 μg/m³	National Primary Standard[6] only
	24 hours	65 μg/m³	National Primary Standard[7] only
Lead (Pb)	Quarterly Average	1.5 μg/m³	National Primary Standard & Nevada Standard
Visibility	Observation	Except as otherwise provided, no owner or operator may cause or permit the discharge into the atmosphere from any emission unit which is of an opacity ≥ 20%.	Nevada Standard only
Hydrogen Sulfide	1 hour	112 μg/m³ (0.08 ppm)	Nevada Standard only

Source : NAC 2004a.

[1] μg/m³ = micrograms per cubic meter; ppm = parts per million.
[2] (a) The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is ≤1.
(b) The 1-hour NAAQS will no longer apply to an area 1 year after the effective date of the designation of that area for the 8-hour ozone NAAQS. The effective designation date for most areas is June 15, 2004.
[3] To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations measured at each monitor within an area over each year must not exceed 0.08 ppm.
[4] Not to be exceeded more than once per year.
[5] To attain this standard, the expected annual arithmetic mean PM_{10} concentration at each monitor within an area must not exceed 50μg/m³.
[6] To attain this standard, the 3-year average of the annual arithmetic mean $PM_{2.5}$ concentrations from single or multiple community-oriented monitors must not exceed 15 μg/m³.
[7] To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 65 μg/m³.

Attainment status for pollutants within the Project Area is determined by monitoring levels of criteria pollutants for which National Ambient Air Quality Standards (NAAQS) and Nevada Ambient Air Quality Standards exist. Air quality in Elko County is classified as attainment or unclassified for all pollutants. Attainment or unclassified designation means no violations of Nevada or national air quality standards have been documented in the region.

Air Quality Monitoring Data

PM_{10} ambient air quality data have been collected within the town of Elko since 1993. Ambient ozone data were also collected at the town of Elko from 1997 through 2001. Newmont collected PM_{10} data at the Gold Quarry Project located approximately 13 miles northwest of the Emigrant Project Area. **Table 3-6** lists available air quality monitoring data for the Emigrant Project Area and surrounding sites.

TABLE 3-6
PM_{10} and Ozone Monitoring Data

PM_{10} Monitoring Data [1]

Site	Year	Annual Mean (µg/m³)	24-Hour High (µg/m³)	24-Hour 2nd High (µg/m³)
City of Elko #1	1993	28.8	79	66
	1994	31.3	87	59
	1995	35.4	75	74
	1996	32.3	119	107
	1997	24.8	49	48
	1998	21.8	103	65
	1999	28.9	115	93
	2000	28	98	91
	2001	32.6	119	84
City of Elko #2	1998	18	75	67
	1999	23.8	136	120
	2000[2]	25.1 / 21.8	712 / 127	441 / 91
	2001	26.5	129	102
Newmont Gold Quarry Project	1995[3]	19	44	NA
	1996	23	83	
	1997[4]	15	35	

Ozone Monitoring Data

Site	Year	Annual Mean (ppm)	1-Hour High (ppm)	1-Hour 2nd High (ppm)	8-Hour Running Average (ppm)
City of Elko	1997	0.0469	0.089	0.077	0.076
	1998	0.0502	0.084	0.08	0.073
	1999	0.0518	0.08	0.075	0.069
	2000	0.0514	0.086	0.076	0.069
	2001	0.0559	0.091	0.086	0.075

Source: U.S. Environmental Protection Agency 2004a, 2004b.

[1] PM_{10} = particulate matter smaller than 10 microns; µg/m³ = micrograms per cubic meter; ppm = parts per million; NA = not available.

[2] First value includes an exceptional event recorded in 2000; second value does not include the exceptional event.

[3] Data collection is for last three quarters of 1995 only.

[4] Data collection is for first quarter of 1997 only.

PM_{10} data from the Elko and Battle Mountain monitoring stations represent air quality within populated areas. Primary contributors to ambient particulate concentrations in populated areas are road dust and residential wood smoke. Air quality data from Newmont's Gold Quarry Mine monitoring station are more representative of air quality surrounding active mine sites in the area, however Gold Quarry mining and ore processing operations are considerably larger than the proposed Emigrant Project. Two violations of the PM_{10} NAAQS were recorded at the City of Elko #2 site in 2000. These data were flagged as being exceptional. No other air quality violations have been identified at any of the stations.

PSD Classification

The area surrounding the proposed Emigrant Project is a designated Class II area as defined by the federal Prevention of Significant Deterioration of Air Quality (PSD) program. The PSD Class II designation allows moderate growth or degradation of air quality within certain limits above baseline air quality. Industrial sources proposing construction or modifications must demonstrate that proposed emissions would not cause significant deterioration of air quality in all areas. Standards for significant deterioration are stricter for Class I areas than Class II areas. The nearest Class I area is the 64,667-acre Jarbidge Wilderness, located approximately 80 miles northeast of the proposed Emigrant Project Area.

The Jarbidge Wilderness contains rugged, glaciated mountainous terrain. The Jarbidge Mountains form a single crest and maintain elevations between 9,800 and 11,000 feet for approximately seven miles. Eight peaks exceed 10,000 feet amsl. Scenic views within the Jarbidge Wilderness range from sagebrush flatland to high, rugged, rocky peaks. As a federal mandatory Class I area, the Jarbidge Wilderness receives visibility protection through the PSD air quality permitting process. There are no designated Integral Vistas associated with the Jarbidge Wilderness.

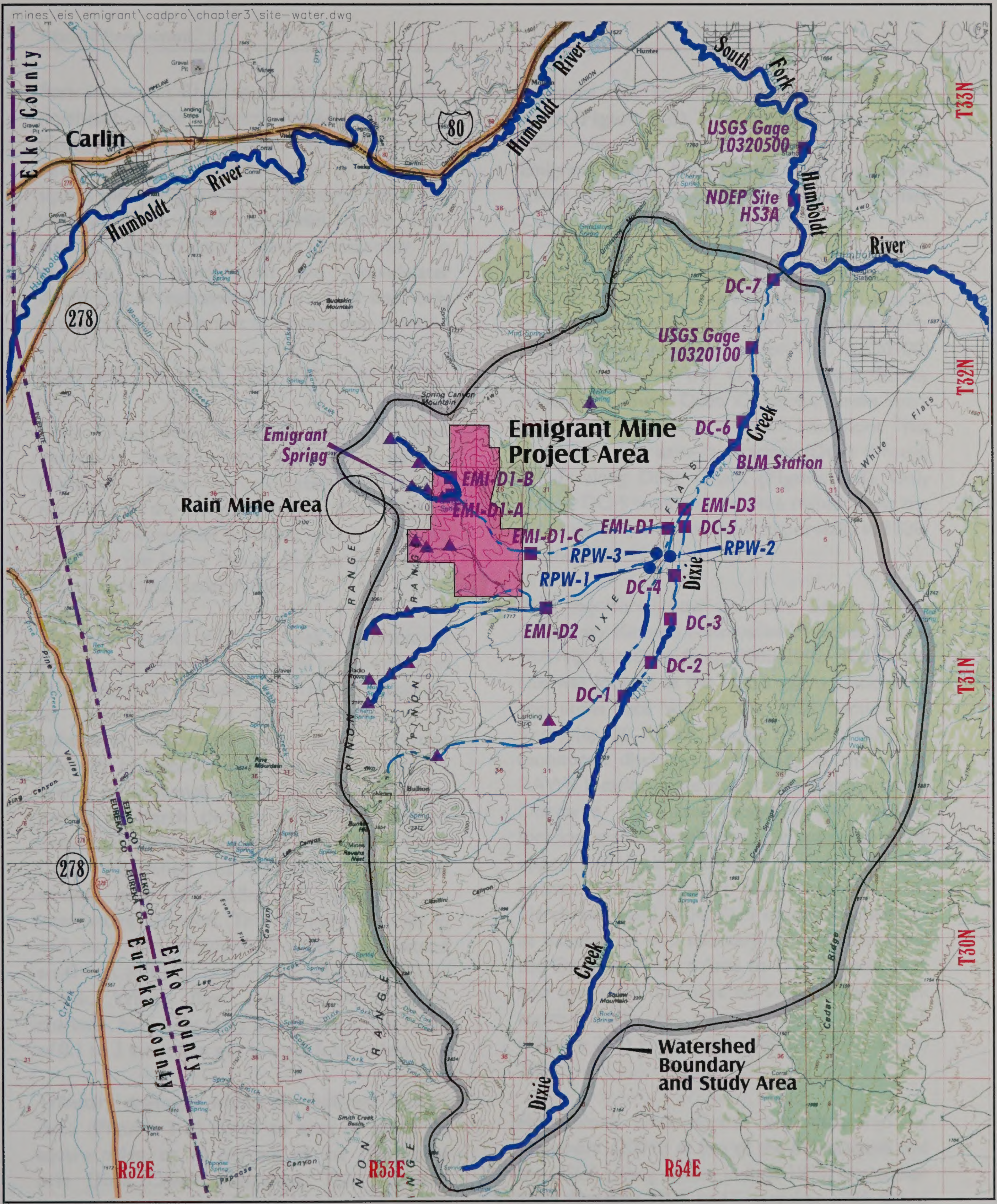
Two other wilderness areas are located in the Humboldt National Forest southeast of the Project Area: East Humboldt Wilderness and Ruby Mountain Wilderness. Neither of these wilderness areas are mandatory federal Class I airsheds. The BLM manages ten Wilderness Study Areas (WSA) in the Elko District, seven of which (all or portions of) have been recommended for wilderness designation. None of these WSAs are mandatory Class I airsheds (Hawthorne 2004).

Ongoing Operations

Existing exploration operations in the Emigrant Project Area produce criteria pollutant emissions, most notably from particulate matter. Fugitive particulate matter emissions are created from drilling, blasting, and hauling operations; as well as from road dust. Combustion products including carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and hydrocarbons are emitted from vehicle engines. Newmont's Rain Mine Operations Area is currently the only existing mining and ore-processing operation in the vicinity of the proposed Emigrant Project Area. Mining operations at the Rain Mine have ceased but the leaching process is ongoing.

WATER QUANTITY AND QUALITY

The Study Area for water resources within and near the Project Area includes the Dixie Creek watershed within hydrographic area no. 48 (Dixie Creek – Tenmile Creek Area) and the South Fork Humboldt River from the Dixie Creek confluence downstream to the NDEP water quality monitoring site (HS3A) and USGS gaging station (10320500) (**Figure 3-5**). Hydrographic area no. 48 covers 392 square miles. Dixie Creek drains north to the South



Basemap Source: Sure!MAPS RASTER 1:100,000 Nevada Map

N

0 Miles 3

▲ Spring or Spring Complex
■ Surface Water Monitoring Station
● Water Supply Well
Perennial Stream Reach
Ephemeral or Intermittent Stream Reach

Water Resources
Emigrant Mine Project
Elko County, Nevada
FIGURE 3-5

Fork Humboldt River approximately eight miles northeast of the Emigrant Project Area. Dixie Creek is located 3 to 4 miles east of the Project Area and has a watershed area of about 170 square miles (**Figure 3-5**). Drainages within this watershed are either perennial (flows year-round), intermittent (flows seasonally in response to precipitation and groundwater discharge), or ephemeral (short-term flow only in response to snowmelt and major rain events).

SURFACE WATER QUANTITY

Dixie Creek flows north to the South Fork Humboldt River, which then flows to the Humboldt River approximately ten miles northeast of the Emigrant Project Area (**Figure 3-5**). This watershed is bound on the west and south by the Piñon Range, and on the east by White Flats and Cedar Ridge.

The main channel of Dixie Creek is intermittent in some segments of the channel and perennial in other segments (**Figure 3-5**). Tributary channels to Dixie Creek are small intermittent or ephemeral drainages with flow occurring primarily in response to significant precipitation events or snowmelt runoff, typically during the period of March through June. According to Siebert and Kiracofe (1988), the entire Dixie Creek watershed has 39 miles of perennial stream, and 153 miles of ephemeral or intermittent channels. The tributary channels in and near the Emigrant Project Area extend southeast and east to the main channel of Dixie Creek. Where flow does occur in these channels, base-flow rates usually are in the range of 0.1 to 1 cubic feet per second (cfs) or less.

Tributary drainages within the Emigrant Project Area (**Figure 3-5**) cover an area of about 28 square miles, or 16 percent of the 170-square mile Dixie Creek watershed. The proposed Project Area is located in the upper half of this tributary drainage. Tributaries that drain the Project Area are relatively small ephemeral channels, except for some upper reaches that are perennial due to discharge from springs and seeps (**Figure 3-5**). Flow typically disappears in these channels near the west side of the Emigrant Project Area, except during periods of spring runoff when water flows to or near Dixie Creek.

Dixie Creek is perennial in its upper reaches, but typically flows only several months each year at its confluence with South Fork Humboldt River (**Figure 3-5**). A gaging station (no. 10320100) was operated by the U.S. Geological Survey (USGS) on lower Dixie Creek for seven years from 1990 through 1996. Newmont has monitored flow at seven stations (DC-1 through DC-7) along Dixie Creek (**Figure 3-5**). Only station DC-5 is monitored on a regular basis; the other stations were monitored primarily in 1988-89 and 1994-97.

BLM monitored flow on Dixie Creek at two temporary Remote Automated Weather Station (RAWS) locations from 2000-2002. The lower site was located at the USGS gaging station and the upper site was in the SE¼ Section 31, Township 30 North, Range 54 East. BLM has monitored discharge periodically at the upper RAWS location since the station was removed. Discharge was also monitored at another location approximately one mile upstream of the upper RAWS in Section 6 during 1982 and between 2001 and the present time. During March and April 2004, BLM measured discharge at six sites on two tributary channels that drain the Emigrant Project Area to Dixie Creek. BLM also measured discharge on lower Dixie Creek approximately ½ mile upstream of DC-6 (**Figure 3-5**) in the early 1980s and in 2003 and 2004.

Flow along Dixie Creek was measured by Newmont (2004f) at five of the DC-stations and the USGS gaging station in June 1993, November 1994, October 1995, and September 1996. Based on these results (**Table 3-7**), Dixie Creek has perennial flow at uppermost station DC-1 and in the vicinity of DC-6 (**Figure 3-5**). **Table 3-7**

also presents mean monthly precipitation values for the month of measurement and the previous month from one of the nearby precipitation stations. The first two synoptic runs in June 1993 and November 1994 had above average precipitation whereas the last two events in October 1995 and September 1996 had below average precipitation. As previously stated, Dixie Creek usually contributes surface flow to South Fork Humboldt River seasonally for several months per year. Riparian habitat improvements along portions of lower Dixie Creek likely have resulted in longer periods of flow in this area.

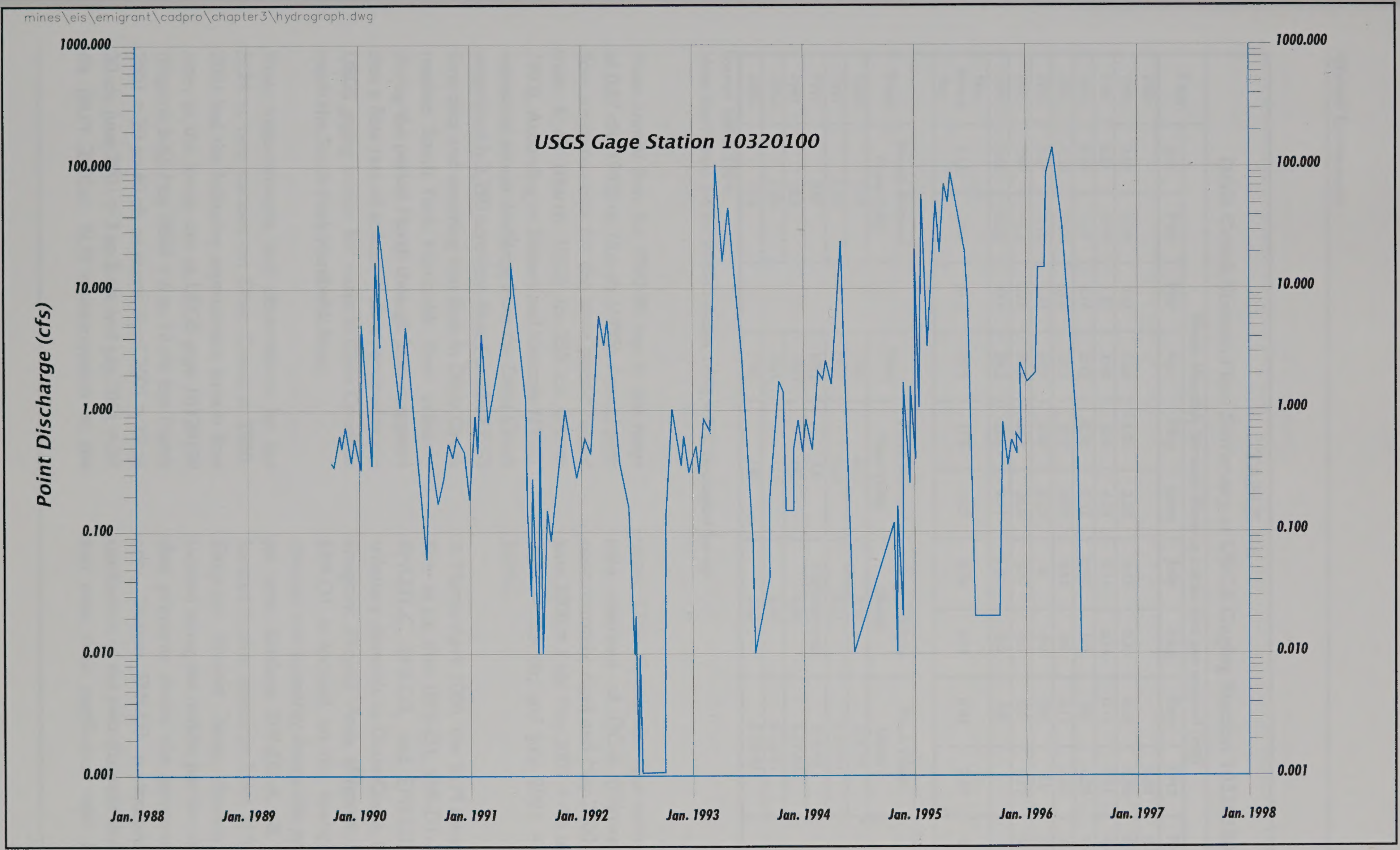
The watershed upslope of the Emigrant Project Area includes the Rain Mine waste rock disposal facility and undeveloped hills with sagebrush and grass vegetation. The primary drainage channel that extends through the proposed mine area generally is trapezoidal with a top width of about 20 feet, bottom width of about 5 feet, depths of 5 to 10 feet, and a longitudinal slope of 3 to 4 percent (Simons & Associates 2004). The channel bottom consists of alluvial sediment of silt-sand-gravel-cobble size. Channel cross-sections for Dixie Creek at stations DC-1, DC-4, DC-5, and the USGS gage are presented in Newmont's (2004f) report, "Dixie Flats, Ground-Water and Surface-Water Monitoring Results".

Table 3-8 summarizes 1990-96 flow data for Dixie Creek at the USGS gaging station 10320100, located approximately 1.5 miles upstream of the confluence with South Fork Humboldt River. A hydrograph of mean daily discharge versus time for this Dixie Creek gaging station is presented on **Figure 3-6**. Mean monthly flows at the gaging station range from no flow in some years for July/August/September to >50 cfs in some years for March/April/May. Highest mean of monthly flows occurs in March/April/May in the range of about 17 to 22 cfs. Lowest mean of monthly flows occurs in August/September (0.005 to 0.007 cfs).

TABLE 3-7
Seepage Run Flow Measurements for Dixie Creek

Station [1]	Flow Measurement (cubic feet per second – cfs) [2]			
	June 17, 1993	Nov. 4, 1994	Oct. 10, 1995	Sept. 24, 1996
Upstream				
DC-1	3.10	1.38	0.26	NM
DC-4	1.78	0	0	0
DC-5	1.37	0.02	0.01	NM
DC-6	2.18	0.32	NM	NM
USGS Gage	1.71	0	NM	NM
DC-7	0	0	0	0
Downstream				
Precipitation at Jiggs 8 SSE Zaga, NV (inches per month) [3]	May 1993 – 2.07/2.03 June 1993 – 1.86/0.92	Oct. 1994 – 1.47/0.93 Nov. 1994 – 2.58/1.22	Sept. 1995 – 0.71/0.98 Oct. 1995 – 0.00/0.93	Aug. 1996 – 0.05/0.66 Sept. 1996 – 0.40/0.98

Source: Newmont 2004f; Western Regional Climate Center 2004e.
[1] See **Figure 3-5** for station locations.
[2] NM = not measured.
3 First value is monthly total precipitation (inches) for specified month; second value is mean monthly precipitation (inches) for period of 1978 – 2004.



Source: Newmont 2004

Hydrograph for Dixie Creek Flow at USGS Gage
Emigrant Mine Project
Elko County, Nevada
FIGURE 3-6

TABLE 3-8
Dixie Creek Stream Flow Summary at USGS Gaging Station 10320100

Year	Mean Monthly Stream Flow in cubic feet per second (cfs)											
	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
1989										0.43	0.53	0.48
1990	0.69	2.09	9.83	5.26	2.02	2.23	0.17	0.20	0.24	0.40	0.52	0.36
1991	0.51	0.99	1.32	3.40	10.9	4.19	0.14	0.14	0.11	0.31	0.64	0.38
1992	0.49	1.57	4.14	2.43	0.39	0.12	0.002	0.0	0.0	0.29	0.62	0.41
1993	0.38	0.67	65.6	27.7	21.9	4.02	0.13	0.0	0.13	1.02	0.26	0.49
1994	0.61	1.10	1.83	3.07	5.60	0.20	0.	0.0	0.0	0.0	0.04	0.53
1995	3.49	12.2	22.9	39.8	57.9	24.0	2.07	0.0	0.0	0.17	0.45	0.67
1996	1.86	6.32	43.4	74.2	23.8	2.11	0.001	0.0	0.0			
Mean Monthly Flow	1.15	3.56	21.3	22.3	17.5	5.27	0.36	0.05	0.07	0.37	0.44	0.47

Year	Mean Annual Flow (cfs)	Year	Peak Annual Flow (cfs)	Gage Height (feet)	Peak Flow Date
1990	2.00	1990	65.0	2.50	3-3-90
1991	1.92	1991	26.0	2.11	5-14-91
1992	0.87	1992	6.0	Not measured	5-4-92
1993	10.3	1993	350	4.54	3-17-93
1994	1.09	1994	113	3.14	5-12-94
1995	13.6	1995	140	3.67	5-10-95

Source: USGS 2004c.
Note: See **Figure 3-5** for station location. USGS = U.S. Geological Survey.

Mean annual flow for 1990-95 was in the range of 0.87 cfs (1992) to 13.6 cfs (1995). Annual peak flow measurements for the same period ranged from 6 cfs (March 1992) to 350 cfs (March 1993). According to Siebert and Kiracofe (1988), estimated annual discharge from the Dixie Creek watershed is 2,290 acre-feet. Based on the USGS flow data and assuming that flow in Dixie Creek reaches South Fork Humboldt River primarily during the period March through June, it appears that a flow rate of at least 5 cfs is required at the USGS gaging station for water in Dixie Creek to reach the South Fork Humboldt River.

Flow measurements and observations by the BLM at two stations on Dixie Creek in 2000-2001 had the following approximate stream flow rates at the lower site at USGS gage 10320100 (**Figure 3-5**): May 2000 = 6 to 10 cfs; late March 2001 = 20 to 40 cfs or more; April 2001 = 10 to 20 cfs; June 2001 = 3 to 5 cfs; and July 2001 = 2+ cfs (BLM 2005a). BLM measurements at the upper Dixie Creek site approximately one-half mile upstream of DC-6 (**Figure 3-5**) were approximately: April and May 2000 = 2 to 4 cfs; June 2000 = 1 cfs; May 2001 = 4.5 to 6.5 cfs; June 2001 = 3.5 cfs; and July 2001 = 3 cfs (BLM 2005a).

In March-April 2004, the BLM measured stream flow at six sites (EMI-D1, EMI-D1-A, EMI-D1-B, EMI-D1-C, EMI-D2, and EMI-D3) along two tributary channels to Dixie Creek that drain the Emigrant Project Area (**Figure 3-5**). Station EMI-D1 is located on the lower part of the channel that primarily drains the proposed mine pit area. Stations EMI-D1-A, -B, and -C are located farther upstream from EMI-D1 near the Emigrant Project Area. Station EMI-D2 is located along the middle portion of the channel that primarily drains the proposed leach pad area. Station EMI-D3 is located below the confluence of the two channels described above and near their confluence with Dixie Creek.

Results of BLM measurements show that on March 16, 2004, flows at stations EMI-D1 and EMI-D2 were 10.9 and 4.1 cfs, respectively (**Table 3-9**). Flow measured at the combined channels farther downstream (EMI-D3) on the same day, however, was only 6.9 cfs, indicating that about 8 cfs was lost to the subsurface in Dixie Creek valley prior to reaching Dixie Creek. Flow in Dixie Creek below the tributary confluence (near DC-6) on March 16, 2004 was 33.6 cfs. On March 24, 2004, measurements at the same locations indicate that the combined flow of the two tributary channels (EMI-D1 & EMI-D2) was 7.4 cfs, which is similar to the measurement of 7.6 cfs for the combined channels at EMI-D3 on March 24 (**Table 3-9**). On the same day, Dixie Creek below the tributary confluence near DC-6 had a flow rate of 38.4 cfs.

Highest flow measured by BLM (2004a) for tributary channel stations EMI-D1, EMI-D2, and EMI-D3 was 12.7 cfs at EMI-D1 on March 23, 2004 (**Table 3-9**). This tributary drains the northern part of the Emigrant Project Area. Lowest flow was 0.26 cfs at EMI-D2 on March 24, 2004. Flow measurements in 2003-04 for lower Dixie Creek one-half mile upstream of DC-6 were in the range of 0.34 cfs (July 21, 2003) to 42.1 cfs (March 23, 2004). Flow rates at this Dixie Creek station between 1982 and 1985 were in a similar range of 1.3 to 45 cfs.

Several springs are located in the vicinity of the Emigrant Project Area, most of which are located in headwater areas of the Piñon Range (6,000 to 6,500 feet elevation) west-southwest of the Study Area (**Figure 3-5**). The two forks of the tributary drainage to Dixie Creek that extend through the north-central portion of the Project Area immediately west of the proposed mine area each contain two or three springs or spring complexes that provide year-round base flow to these channels, flowing east to the Emigrant Project Area. Emigrant Spring is located in the upper reach of the southern-most of the two forks in the SW¼NE¼ of Section 34 (**Figure 3-5**). Three more springs are located in the upper portion of the tributary drainage located in the southern portion of the Project Area. This channel extends immediately west and south of the proposed heap leach facility area. Most springs are associated with major geologic structures.

Flow from Emigrant Spring has been periodically measured by Newmont (2004g) since May 1997. Results of these measurements show that flow generally has been in the range of 0.01 to 0.03 cfs (5 to 15 gallons per minute (gpm)) during the summer-fall period, with some instances of no flow. April, May, and June measurements in 2003 and 2004 had flows of less than 0.6 cfs (270 gpm) downstream of the Emigrant Spring site where surface water runoff contributes to flow from Emigrant Spring.

Flow rates of other springs discussed above that are west of the Emigrant Project Area are generally less than 0.01 cfs (5 gpm). BLM measured flows of springs upgradient (west) of the Emigrant Project Area in September 1981 and August 2003 with resulting flow rates of 1.0 gpm or less (BLM 1981, 2003). There are no natural ponds or lakes in the vicinity of the Emigrant Project. In general, flow from springs upgradient (west) of the Emigrant Project Area extend down to the west side of the Project Area and then often go subsurface prior to reaching the middle of the Project Area (**Figure 3-5**).

On March 31, 2004, the BLM measured flow in the two forks of the tributary that extend through the northern portion of the Project Area; these measurements were 1.07 and 2.72 cfs in the west side of the Project Area (stations EMI-D1-A and EMI-D1-B on **Figure 3-5**; also see **Table 3-9**). On the east side of the Project Area, the flow rate in the tributary channel was 3.22 cfs on March 31, 2004 (station EMI-D1-C on **Figure 3-5**). Therefore, on that day, water was flowing in that tributary channel through the entire Emigrant Project Area. Farther

TABLE 3-9
Flow Measurements for Dixie Creek and Tributary Downstream of Emigrant Project Area

Station ID	Legal Location	Date	Time (hour)	Flow (cfs)
EMI-D1 (north tributary near Dixie Creek)	T31N R54E Sec.03, SWNW	3-8-04	1135	1.38
		3-16-04	1640	10.87
		3-23-04	1530	12.66
		3-24-04	1230	7.16
		3-31-04	1400	2.63
		4-13-04	1120	1.37
EMI-D1-A (Emigrant Spring tributary)	T32N R53E Sec.35, NWSE	3-31-04	1100	1.07
EMI-D1-B (northwest tributary)	T32N R53E Sec.35, NWSE	3-31-04	1130	2.72
EMI-D1-C (north tributary below Project Area)	T31N R54E Sec.06, SWSW	3-31-04	1300	3.22
EMI-D2 (south tributary)	T31N R54E Sec.07, SWSE	3-16-04	1525	4.07
		3-24-04	1450	0.26
EMI-D3 (combined north & south tributaries)	T32N R54E Sec.34, NWSE	3-16-04	1320	6.91
		3-24-04	1700	7.56
Dixie Creek – Lower (½-mile above DC-6)	T32N R54E Sec.26, NESW	5-10-82	---	30
		7-14-82	---	1.7
		9-13-82	---	1.3
		6-21-83	---	37
		9-26-83	---	1.5
		4-24-84	1100	45
		6-26-84	---	22
		8-19-85	---	2
		5-20-03	1000	15.94
		7-21-03	NR	0.34
		9-11-03	1030	0.44
		3-8-04	1306	2.85
		3-16-04	1146	33.59
		3-23-04	1000	42.13
		3-24-04	1000	38.43
		4-13-04	1930	15.45

Source: BLM 2004a; Siebert and Kiracofe 1988.
Note: See **Figure 3-5** for station locations. cfs = cubic feet per second; T = Township; R = Range; Sec. = Section; N = north; S = south; E = east; W = west.

downstream at station EMI-D1, flow measured on March 31, 2004 was 2.63 cfs, indicating that about 0.4 cfs was gained in this channel between EMI-D1-C and EMI-D1 (**Table 3-9** and **Figure 3-5**).

Surface water runoff in the watershed that contains the Emigrant Project Area was calculated by Simons & Associates (2004) using the HEC-1 computer model. For this model, Simons & Associates (2004) estimated the total amount of area to be mined would be 0.48 square miles, with an upstream drainage area of 4.18 square miles (i.e., drainage area upstream of sub-basins where mining would occur). The total sub-basin area down to the outlet point below the area to be mined is 5.17 square miles. The estimated area to be mined would be about 9 percent of this 5.17 square mile sub-basin used in the model. The HEC-1 model was used to compute runoff for a range of storm events having return periods of 2 years to 500 years, as well as the Probable Maximum Flood (PMF), for several locations upstream and inside the Emigrant Project Area. **Table 3-10** presents peak flow and volume calculated for the entire 5.17 square mile sub-basin that includes the proposed mine area. At this location, peak flows are in the range of 44 to 707 cfs for return periods ranging from 2 to 500 years.

Flooding in 1910, 1914, 1917, 1943, 1952, 1961-63, 1971, 1979, and mid-1980s caused severe damage to the Dixie Creek channel and bridge (Siebert and Kiracofe 1988), and likely had similar effects on some tributary channels to Dixie Creek. The estimated peak flow in 1979 at this Dixie Creek site located in Section 26 (T32N, R54E) was 752 cfs (Siebert and Kiracofe 1988).

The Crane Springs sub-watershed is located along the east side of the Dixie Creek watershed and covers an area of 17,920 acres. Siebert and Kiracofe (1988) used a model to calculate a maximum discharge of 112.4 cfs for the 20-year return period from the Crane Springs area. They also estimate that the portion of Dixie Creek watershed that does not contain the Crane Springs drainage has seven times more surface water flow than the Crane Springs sub-watershed. Based on this assumption, the largest peak flow on lower Dixie Creek during 1965-85 was 784 cfs (in 1975) above the confluence with Crane Springs drainage, and 896 cfs at the mouth of Dixie Creek (Siebert and Kiracofe 1988).

TABLE 3-10
Modeled Peak Flow and Volume of Watershed Containing the Proposed Emigrant Mine

Return Period (years)	Peak Flow (cubic feet per second)	Volume (acre-feet)
2	44	19
5	67	32
10	98	48
25	169	89
50	214	112
100	312	166
500	707	343
Probable Maximum Flood (PMF)	6,552	1,939

Source: Simons & Associates 2004
Note: Watershed includes 5.17 square miles, extending from the west side to the east side of the proposed mine pit area.

TABLE 3-11 Monthly Stream Flow for Lower South Fork Humboldt River												
Period of Record	Mean Monthly Stream Flow in cubic feet per second (cfs)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
South Fork Humboldt River Below Dixie Creek (USGS Gage No. 10320500)												
1937-1973	38.1	64.8	105	210	376	482	133	16.8	6.4	14.5	25.3	29.5

Source: USGS 2004c.
Note: See **Figure 3-5** for station location. USGS = U.S. Geological Survey.

A USGS gaging station is located on South Fork Humboldt River below the Dixie Creek confluence (**Figure 3-5**). This station (no. 10320500) was monitored from 1937 to 1973, with some gaps in the record. Results of this monitoring show that mean monthly flows for lower South Fork Humboldt River are lowest in August/September/October (6.4 to 16.8 cfs), and highest in May and June (376 to 482 cfs) (**Table 3-11**). Mean annual flows for the lower South Fork Humboldt River station are in the range of 23 to 226 cfs for the most recent 25-year period of record (USGS 2004c).

WATER QUALITY STANDARDS

Nevada water is regulated for quality standards that are established by the State of Nevada under Nevada Water Pollution Control regulations and statutes (Nevada Administrative Code [NAC] 445A.070 et seq.; Nevada Revised Statutes [NRS] 445A.300 et seq.). Both numeric and narrative criteria are included in Nevada's water quality standards. Numeric water quality criteria (NAC 445A.144) apply to Class waters and Designated waters. Numeric standards are established for designated beneficial uses (i.e., irrigation, livestock watering, aquatic life, recreation, municipal or domestic supply, industrial supply, and propagation of wildlife) and are summarized in **Table A-1** in **Appendix A**. Some of these standards are taken from the Humboldt River control point (Designated water) at the Palisade gage (NAC 445A.204), which is located approximately ten air miles downstream of the Carlin gage.

Some streams in Nevada are classified as Class A, B, C, or D, with Class A streams of best quality and Class D streams of poorest quality (NAC 445A.123-127). Dixie Creek and its tributaries are not specifically classified; however, South Fork Humboldt River in this area is Class B. As such, Dixie Creek would also be a Class B water under the "tributary rule" (NAC 445A.145). Standards for Class B streams are summarized in **Table A-2** in **Appendix A**. Narrative standards applicable to all surface water in the state are specified in NAC 445A.121.

Federal drinking water standards included in **Table A-1** in **Appendix A** are applicable to groundwater. There are primary and secondary maximum contaminant levels (MCLs), with secondary standards based on aesthetic characteristics of taste, odor, and/or staining. The Nevada municipal or domestic supply standards in **Table A-1** can be used if there are no corresponding federal drinking water standards.

NDEP compiles the Section 303(d) list (Clean Water Act) for development of "Total Maximum Daily Loads" (TMDLs) for impaired water bodies. In general, a water body was included on the Section 303(d) list if the beneficial uses were not met more than 25 percent of the time. Dixie Creek has not been evaluated for inclusion on

Nevada's 303(d) list of impaired water bodies; however, South Fork Humboldt River from Lee to its confluence with the Humboldt River is listed for total iron and total phosphorus (NDEP 2002).

Waste discharges to any state water must be such that no impairment of beneficial use occurs as a result of the discharge (NAC 445A.120[2]). No discharges, however, are planned for the Emigrant Project.

SURFACE WATER QUALITY

Surface water has been sampled and analyzed from several locations along Dixie Creek and from some tributaries of Dixie Creek that drain the Emigrant Project Area. During a 4-year period from 1982 through 1985, eight water samples were collected by BLM from Dixie Creek one-half mile upstream of station DC-6 where the road crosses the channel (**Figure 3-5**) (Siebert and Kiracofe 1988). These water quality results are summarized in **Table 3-12**. The flow rate of Dixie Creek at the time these samples were collected ranged from 1.3 to 45 cfs. The BLM (2004a) collected another eight water samples from the same location on Dixie Creek in 2003-04 and analyzed them for 6-8 parameters (**Table 3-12**).

Surface water in Dixie Creek upstream from DC-6 generally is a sodium-bicarbonate type with pH in the range of 7.1 to 8.8 standard units. Water temperature ranges from 7 to 25 degrees Celsius (°C), and total dissolved solids (TDS) is in the range of 150 to 300 milligrams per liter (mg/L). Electrical conductivity ranges from 150 to 550 micromhos per centimeter (µmhos/cm). Sulfate in Dixie Creek ranged from 14 to 31 mg/L. Nitrate concentrations were less than 2 mg/L. Comparison of the early Dixie Creek samples (1982-85) to recent samples (2003-04) shows no significant changes or trends based on the limited data.

Sediment levels often are high in Dixie Creek. The range of total suspended solids (TSS) measured in 1986 at the BLM Dixie Creek station upstream of DC-6 was 160 to 2,910 mg/L, with flow rates in the range of 8 to 70 cfs (Siebert and Kiracofe 1988). Turbidity measurements at the same Dixie Creek location in 1982-85 were in the range of 1 to 585 Jackson Turbidity Units (JTU), with highest sediment load occurring during higher flows (**Table 3-12**). In 2003-04, TSS and turbidity measured by the BLM (2004a) in Dixie Creek upstream of DC-6 were in the ranges of 5 to 206 mg/L, and 5 to 233 Nephelometric Turbidity Units (NTU), respectively (**Table 3-12**). These values show that sediment concentrations decline in Dixie Creek below where tributary channels from the Emigrant Project Area enter the creek. Additional reduction in sediment load along lower Dixie Creek is expected due to the riparian improvements.

In March-April 2004, BLM (2004a) collected and analyzed surface water samples from some channels in and near the Emigrant Project Area that are tributary to Dixie Creek (**Table 3-13**). The sample sites (EMI-D1, EMI-D1-A, EMI-D1-B, EMI-D1-C, EMI-D2, EMI-D3) are shown on **Figure 3-5**. Water temperature for these samples was relatively warm, with one exception, ranging from 13 to 19 °C. Electrical conductivity and pH were in the range of 100 to 400 µmhos/cm, and 7.8 to 9.6 standard units, respectively. Two samples were analyzed for sulfate (14 and 31 mg/L) and total phosphorus (0.17 and 3.33 mg/L). For comparison purposes, the samples collected by BLM from Dixie Creek in 2003-04 are included in **Table 3-13.**

Turbidity and TSS in most samples from Dixie Creek tributary channels collected in March-April 2004 were in the range of 20 to 240 NTU and 20 to 210 mg/L, respectively. Three of the samples, however, had higher sediment levels of >750 NTU for turbidity, and >800 mg/L for TSS.

TABLE 3-12
Water Quality Data for Dixie Creek at Road Crossing One-Half Mile Upstream of DC-6 (1982-1985 and 2003-2004)

Parameter	Sample Date							
	5-10-82	7-13-82	9-14-82	6-21-83	9-26-83	4-24-84	6-26-84	8-19-85
Flow (cfs)	30	1.7	1.3	37	1.5	45	22	2
Temperature (ºC)	---	19	15	20	17	8	19	25
Conductivity (µmhos/cm)	---	---	---	150	400	185	200	---
pH (su)	7.7	8.3	7.7	8.1	8.8	8.0	8.2	---
TDS	152	281	264	---	---	---	---	---
Dissolved Oxygen	---	---	---	---	---	12.3	---	---
Turbidity (JTU)	115	9.6	1.5	37	3	585	33	1.7
Sulfate	15	26	25	---	---	---	---	---
Chloride	5.2	29	25	1	3	11	17	30
Nitrate as N	0.43	ND	0.16	0.4	0.7	1.6	1.5	0.4
Total Phosphate	---	---	---	0/9	0.2	1.2	0.4	0.1
Alkalinity as HCO_3	---	---	---	96	95	74	94	106
Alkalinity as CO_3	---	---	---	0	12	0	ND	10
Bicarbonate	94	168	165	---	---	---	---	---
Carbonate	0	0	0	---	---	---	---	---
Calcium	7.6	22	24	---	---	---	---	---
Magnesium	4.9	5.6	6.0	---	---	---	---	---
Potassium	2.1	7.4	8.6	---	---	---	---	---
Sodium	12	32	53	---	---	---	---	---
Manganese	0.1	ND	ND	---	---	---	---	---
	5-20-03	7-21-03	9-11-03	3-8-04	3-16-04	3-23-04	3-24-04	4-13-04
Temperature (ºC)	7.8	23.9	12.2	8.3	8.9	10.0	6.7	9.4
Conductivity (µmhos/cm)	230	---	550	399	182	156	161	192
pH (su)	7.13	---	7.14	8.21	8.34	8.63	8.30	8.31
Dissolved Oxygen	---	>11	---	>11	---	9.5	9.6	10.9
Turbidity (NTU)	23	4.5	233	68	167	106	96	45
TSS	19	5	206	68	153	103	94	50
Sulfate	14	21	15	29	16	31	31	21
Total Phosphorus	0.157	0.238	0.26	1.76	0.157	0.0978	0.134	0.107

Source: Siebert and Kiracofe 1988; BLM 2004a.

Note: All units are in milligrams per liter (mg/L) unless otherwise specified; cfs = cubic feet per second; ºC = degrees Celsius; µmhos/cm = micromhos per centimeter; su = standard units of pH; JTU = Jackson Turbidity Units; NTU = nephelometric turbidity units; TSS = total suspended solids; ND = not detected; --- = not analyzed. Samples collected in 2003-2004 were analyzed by BLM using in-house instruments.

TABLE 3-13
Water Quality Data for Lower Dixie Creek and Tributaries in Emigrant Project Area (2003-2004)

Station No.	Date & Time	Water Temp (°C)	pH (su)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	Total Suspended Solids (mg/L)	Electrical Conductivity (μS/cm)	Sulfate (mg/L)	Total Phosphorus (mg/L)
EMI-D1 (north tributary near Dixie Creek)	3-8-04 1135 hr	7.8	7.83	---	>1000	>807	290	14.44	3.325
	3-16-04 1640 hr	13.3	8.19	---	779	547	186	---	---
	3-23-04 1530 hr	17.8	8.22	---	---	>807	172	---	---
	3-24-04 1230 hr	13.3	8.24	---	183	153	186	---	---
	3-31-04 1400 hr	17.2	8.91	---	58	60	189	---	---
	4-13-04 1120 hr	15.6	9.12	---	28	23	202	---	---
EMI-D1-C (north trib below Project Area)	3-31-04 1300 hr	16.7	9.06	---	39	40	182	--	---
EMI-D2 (south tributary)	3-16-04 1525 hr	17.8	8.40	---	>1000	>807	285	---	---
	3-24-04 1450 hr	18.9	8.64	---	212	205	401	---	---
EMI-D3 (combined tributaries)	3-16-04 1320 hr	15.6	8.15	8.7	238	189	188	30.9	0.17
	3-24-04 1700 hr	13.3	8.22	---	---	---	191	---	---
Dixie Creek – Lower (½-mile above DC-6)	5-20-03 1000 hr	7.8	7.13	---	23	19	230	14.14	0.157
	7-21-03 NR	23.9	---	>11	4.5	5	---	21.46	0.238
	9-11-03 1030 hr	12.2	7.14	---	233	206	550	14.68	0.26
	3-8-04 1306 hr	8.3	8.21	>11	68	68	399	29.22	1.76
	3-16-04 1146 hr	8.9	8.34	---	167	153	182	16.12	0.157
	3-23-04 1000 hr	10.0	8.63	9.5	106	103	156	30.80	0.0978
	3-24-04 1000 hr	6.7	8.30	9.6	96	94	161	30.90	0.134
	4-13-04 1930 hr	9.4	8.31	10.9	45	50	192	21.06	0.107

Source: BLM 2004a.
Note: See **Figure 3-5** for station locations. °C = degrees Centigrade; su = standard units of pH; mg/L = milligrams per liter; NTU = nephelometric turbidity units; μS/cm = microSiemens per centimeter; hr = hour; --- = not analyzed. Samples collected in 2003-2004 were analyzed by BLM using in-house instruments.

Newmont (2004g) collected and analyzed water samples from Emigrant Spring on a quarterly basis since mid-1994. A statistical summary of water quality data from the Emigrant Spring monitoring site is presented in **Table 3-14** for samples collected during the Fall low-flow

TABLE 3-14 Statistical Summary of Water Quality Data for Emigrant Spring[1]						
Parameter[2]	Number of Samples	Concentration in milligrams per liter (mg/l) Unless otherwise specified in first column				
		Minimum	Maximum	Mean	Median	Standard Deviation
General Parameters, Common Ions, and Nutrients						
EC (μmhos/cm)	8	480	1112	809	849	203
TDS	11	407	852	529	512	122
pH (field su)	10	7.20	7.62	7.44	7.48	0.15
pH (lab su)	10	7.20	7.98	7.65	7.66	0.22
Temp (°F)	8	9.5	21	13.8	12.7	3.8
Alkalinity	11	116	289	250	262	48
Carbonate	5	0.5	0.5	0.5	0.5	0
Bicarbonate	6	229	278	258	264	21.5
Fluoride	10	0.2	0.6	0.44	0.45	0.11
Chloride	7	21	42	26	22	7.5
Sulfate	11	119	422	183	167	82.5
Calcium	7	83	153	101	94	23.6
Sodium	11	23	32.1	28.6	28.9	2.7
Potassium	7	2.8	8.0	3.9	3.1	1.89
Magnesium	7	32	51.8	40.2	39.5	6.63
Phosphorus	7	<0.06	1.09	0.28	0.15	0.37
Nitrate+Nitrite	11	<0.02	3.4	0.32	0.01	1.02
Cyanide, total	2	<0.005	0.01	0.0063	0.006	0.005
Cyanide, WAD	11	<0.005	0.01	0.0048	0.005	0.0008
Metals[3]						
Aluminum	11	<0.03	0.18	0.048	0.015	0.589
Antimony	7	<0.001	<0.002	0.0009	0.001	0.00035
Arsenic	11	<0.02	0.06	0.0235	0.02	0.0189
Barium	7	<0.01	0.12	0.0579	0.047	0.0288
Beryllium	7	<0.001	<0.002	0.0009	0.001	0.00024
Bismuth	7	<0.02	0.03	0.0145	0.014	0.0053
Boron	5	0.1	0.12	0.1028	0.11	0.0227
Cadmium	7	<0.002	<0.004	0.0012	0.001	0.00037
Cobalt	7	<0.007	0.01	0.005	0.004	0.00294
Chromium	7	<0.004	0.01	0.0031	0.003	0.00125
Copper	7	<0.002	0.01	0.0021	0.0015	0.00128
Iron	11	0.2	13.3	2.36	1.2	3.79
Lead	7	<0.001	<0.002	0.0014	0.001	0.00079
Manganese	11	0.1	4.2	0.625	0.273	1.20
Mercury	7	<0.0001	<0.0002	0.0001	0.0001	1.46E-20
Molybdenum	11	<0.005	0.01	0.005	0.004	0.00356
Nickel	7	<0.01	0.02	0.0107	0.01	0.0044
Selenium	11	<0.001	0.02	0.0092	0.005	0.0091
Silver	7	<0.002	0.01	0.0026	0.0025	0.0012
Strontium	7	0.2	0.52	0.303	0.27	0.100
Thallium	7	<0.001	<0.001	0.0005	0.0005	0
Tin	7	<0.001	0.18	0.04	0.019	0.0616
Titanium	7	<0.005	0.01	0.0031	0.0035	0.0013
Vanadium	7	<0.003	0.01	0.0044	0.004	0.0019
Zinc	7	<0.004	0.08	0.0174	0.003	0.0286

Source: Newmont 2004g.

[1] Water samples were collected from Emigrant Spring at station RN-ESPR1 from 1994 through 2004 during Fall low flow season. Data originally reported as less than (<) the laboratory reporting limits were converted to half the "less than value" for purposes of calculating these statistics.

[2] EC = electrical conductivity in micromhos per centimeter (μmhos/cm); TDS = total dissolved solids; su = standard units of pH; °F = degrees Fahrenheit; WAD = weak acid dissociable.

[3] Concentrations of metals are total.

season. Results of these water analyses show that TDS is in the range of 407 to 852 mg/L, with a mean value of 529 mg/L. Temperature varies widely from about 10 to 21 degrees centigrade. This spring water has a mean pH and sulfate of 7.4 standard units and 180 mg/L, respectively. Surface water or aquatic life standards (**Table A-1, Appendix A**) for the following constituents have been exceeded in one or more samples from Emigrant Spring: phosphorus, iron, selenium, and silver.

Surface water quality also has been monitored periodically by NDEP (2004a) at a South Fork Humboldt River station below Dixie Creek (NDEP station no. HS3A; **Figure 3-5**). Turbidity and TSS in most samples from South Fork Humboldt River typically are <15 NTU and <20 mg/L, respectively. There are occasional high sediment levels of up to 550 NTU for turbidity, and up to 400 mg/L TSS (NDEP 2004a). Total dissolved solids (TDS) concentrations are generally in the range of 150 to 300 mg/L for the South Fork Humboldt River site below Dixie Creek. Concentrations of metals for this station measured during 1994-2004 generally are low or below laboratory detection limits (NDEP 2004a).

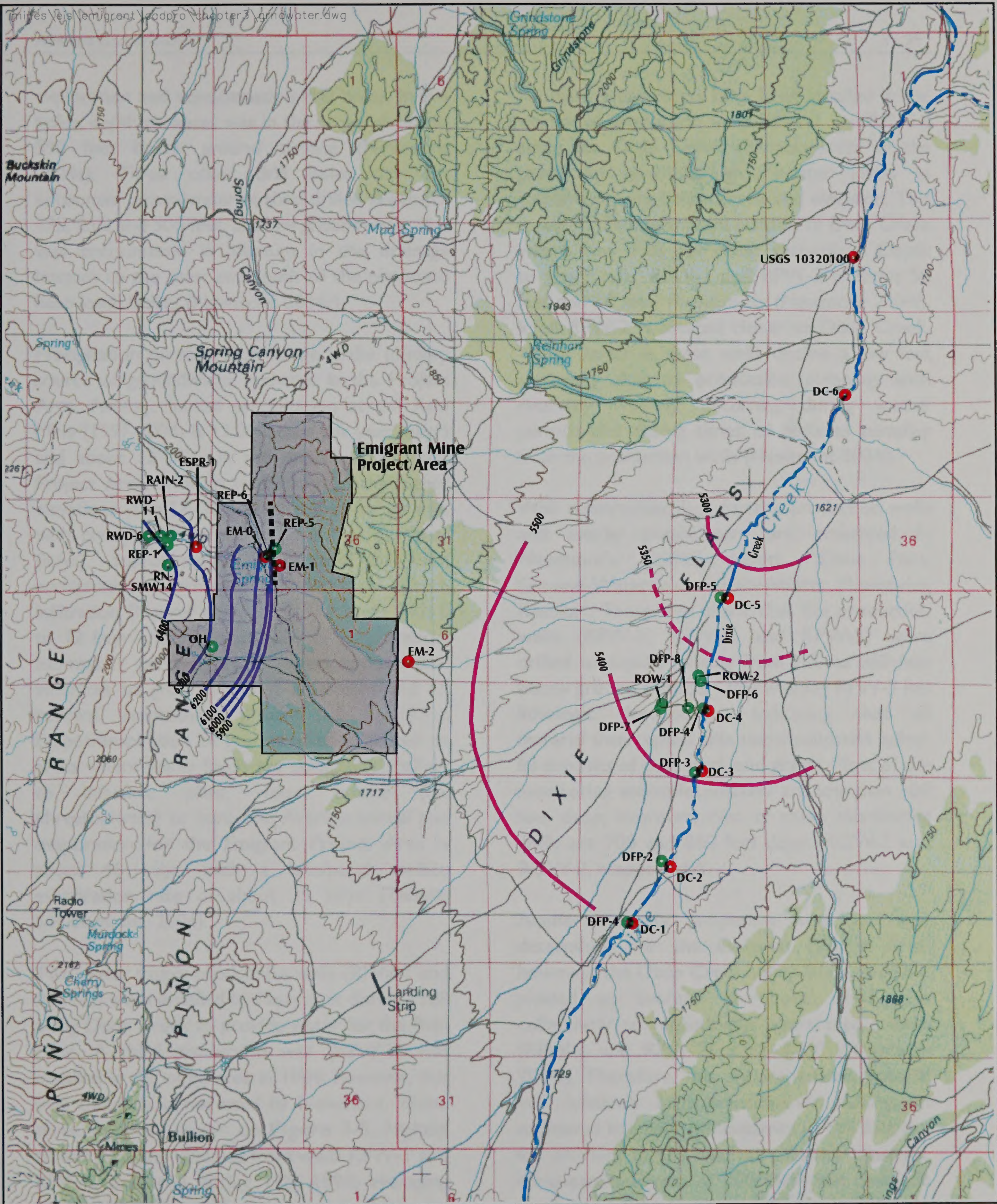
GROUNDWATER QUANTITY

Groundwater in the Emigrant Project Area moves through bedrock consisting of volcanics (extrusive ash/tuff) and sedimentary rocks (limestone, shale, sandstone, and conglomerate) along the Piñon Range. Localized deposits of unconsolidated alluvium along some of the stream channels also have limited groundwater. Groundwater in the Emigrant Project Area flows eastward into basin fill deposits in the Dixie Creek Valley. Wells and piezometers in the Emigrant Project Area are shown on **Figure 3-7**, along with groundwater potentiometric contours for alluvium along Dixie Creek and bedrock in the proposed mine area. Groundwater in Dixie Creek Valley alluvium generally flows to the north at a low gradient of about 0.01 ft/ft. Groundwater in siltstone bedrock in the proposed mine area generally flows west to east at a gradient of about 0.08 ft/ft.

Sedimentary units in the Emigrant Project Area consist of (oldest to youngest) Devils Gate Formation (dolomite and limestone), Webb Formation (siliceous mudstone, claystone, and siltstone), Chainman Formation (shale and sandstone), and Diamond Peak Formation (conglomerate, sandstone, shale, and limestone). Tertiary-age sedimentary rocks also are present in the southern part of the Study Area. The Emigrant Spring Fault trends north-south through the proposed mine area and off-sets the Chainman and Webb formations. The Webb formation is east of the fault, and the Chainman Formation is to the west. The Chainman and Webb Formations unconformably overlie the Devils Gate Formation which outcrops east of the Emigrant Project Area. The Diamond Peak Formation outcrops northwest of the mine area along the west side of Emigrant Springs Fault.

Two piezometers were installed by Newmont west and east of the Emigrant Spring fault. The piezometer west of the fault encountered groundwater above and within the Chainman Formation at a depth of about 100 feet (Simons & Associates 1997). The piezometer east of the fault in the proposed Emigrant Mine area did not encounter groundwater at a depth of 360 feet in the Devils Gate Formation. No groundwater was encountered in 954 exploration holes (drilled on 100-ft centers) in the proposed pit area. This indicates that there are fault blocks in the Emigrant Project Area that isolate zones of groundwater. Shallow perched groundwater was also encountered in some exploration drill holes in alluvium overlying sedimentary bedrock at depths of less than 15 feet (Simons & Associates 1997). Shallow alluvial deposits of interbedded sand and gravel in the drainage bottoms are up to 50 feet thick.

Depth to groundwater in the proposed heap leach facility area was measured in some



Basemap Source: Sure!MAPS RASTER 1:100,000 Nevada Map
Data Source: Newmont 2005

N

0 Feet 8000

Piezometer
Surface Water Monitoring Site
Siltstone Water Contour
Alluvial Water Contour
Approximate Geologic Fault

Groundwater Contours
Emigrant Mine Project
Elko County, Nevada
FIGURE 3-7

exploration and condemnation drill holes. In five holes, depth to water was in the range of 145 to 590 feet below ground surface (Newmont 2004c). Three other drill holes did not encounter groundwater at total drilled depths of 175, 255, and 505 feet. Shallow groundwater also was encountered in alluvium in the drainage bottom to the west and south of the proposed heap leach facility (Newmont 2004c).

Precipitation on the Piñon Range is the primary source of groundwater recharge in the Project Area. Average annual precipitation at the Rain Mine (1997-2004) is 13.08 inches per year (in/yr) and about 12 in/yr in the proposed Emigrant Project Area, with up to 20 in/yr in the higher elevations. The USGS estimates that for an area with precipitation of 12 to 15 inches per year (in/yr), approximately 7 percent of total precipitation recharges groundwater from infiltration (Maurer *et al.* 1996). For areas with 8 to 12 in/yr and 15 to 20 in/yr of precipitation, estimated percentage of precipitation that infiltrates to groundwater is 3 percent and 15 percent, respectively (Maurer *et al.* 1996). Evapotranspiration of groundwater is limited to areas where water levels are sufficiently shallow to influence plant water uptake (i.e. phreatophytes) or bare soil. Average annual pan evaporation for the Emigrant Project Area is about 46 in/yr, with a lake/pond surface evaporation rate of about 35 in/yr (Telesto Solutions, Inc. 2004).

Two water supply production wells (RPW-1 and RPW-2) were installed by Newmont during 1988 along Dixie Creek to provide water for the Rain Mine. A third production well (RPW-3) was installed in the same area in 1984; however, this well currently is not used by Newmont. These three wells are shown on **Figure 3-5**. Highest annual pumping volumes from wells RPW-1 and RPW-2 occurred during 1988-1994, averaging about 100 million gallons per year, decreasing to about 15 million gallons per year during 1995-2004 (Newmont 2004f). Maximum total pumping rate was about 1,500 gpm.

Fourteen piezometers have been installed in the vicinity of production wells RPW-1 and RPW-2 along the Dixie Creek channel. South of the production wellfield, groundwater levels in piezometers are below creek bed elevation. This is one of the intermittent reaches of Dixie Creek where flow does not occur year-round. Depth to water near RPW-1 and RPW-2 is about 50 feet and 10 feet, respectively (Newmont 2004f). Well RPW-2 is located closer to Dixie Creek. Water levels in these wells decline a few feet seasonally due to production pumping, with recovery typically occurring during wetter periods and during times of reduced pumping from the production wells (Newmont 2004f).

Well construction logs for the production wells and nearby piezometers are presented in Newmont's (2004f) report, "Dixie Flats, Ground-Water and Surface-Water Monitoring Results". These logs show that the production wells (RPW-1, RPW-2, and RPW-3) were drilled to depths ranging from 700 to 860 feet below ground surface. Only well log RPW-3 has lithologic descriptions, indicating that all material intercepted was unconsolidated valley-fill deposits of clay, sand, and gravel. Most of the monitoring wells/piezometers are less than 100 feet deep; however, two of these monitoring wells are 700 and 860 feet deep (ROW-1 and ROW-2, respectively).

Aquifer hydraulic properties have not been determined for the Emigrant Project Area; however, the Dixie Creek valley-fill material has yielded an average of about 1,500 gpm collectively to Newmont's water supply wells (RPW-1 and RPW-2) since 1988 (Newmont 2004f). Therefore, this unconsolidated material has relatively high transmissivity. Using an estimated hydraulic conductivity of 100 feet/day for alluvium in the smaller tributary channels, cross-sectional area of 200 feet^2, and hydraulic gradient of 0.04 feet/feet, groundwater flux in alluvium located along the two tributary channels west of the proposed Emigrant Mine pit area is about 600 feet^3/day, or 5 gpm.

Bedrock in the vicinity of the proposed mine site is expected to have low primary permeability, with possible zones of higher permeability where fractures are prevalent and interconnected. As stated above, the Emigrant Spring Fault appears to be a barrier to groundwater flow rather than a zone of higher permeability.

GROUNDWATER QUALITY

Available groundwater quality data in the Emigrant Project Area is limited to water samples collected from Emigrant Spring and other small springs west of Project Area. No monitoring wells are located in the Emigrant Project Area for which groundwater samples have been collected and analyzed. Newmont would install monitoring wells in selected locations and establish baseline water quality conditions in the Project Area in accordance with State Water Pollution Control Permit requirements.

Newmont (2004g) collected samples from Emigrant Spring on a quarterly basis since mid-1994. A summary of these analyses is included in the "Surface Water Quality" section and **Table 3-14**. Comparison of water quality data for Emigrant Spring (**Table 3-14**) to primary or secondary drinking water standards (**Table A-1, Appendix A**) shows that the following standards are exceeded by one or more samples: TDS, sulfate, aluminum, arsenic, iron, and manganese. These likely reflect the regional and mineralized groundwater flow system that probably is a major source of water to Emigrant Spring.

Some chemical parameters were collected in the field by the BLM in 1981 and 2003 for springs located in the tributary drainages west of the Emigrant Project Area. General ranges of these parameters are: electrical conductivity = 100 to 800 micromhos/cm; temperature = 10 to 24 degrees C (one spring was 32 degrees C); and pH = 7.0 to 8.0 standard units (BLM 1981, 2003).

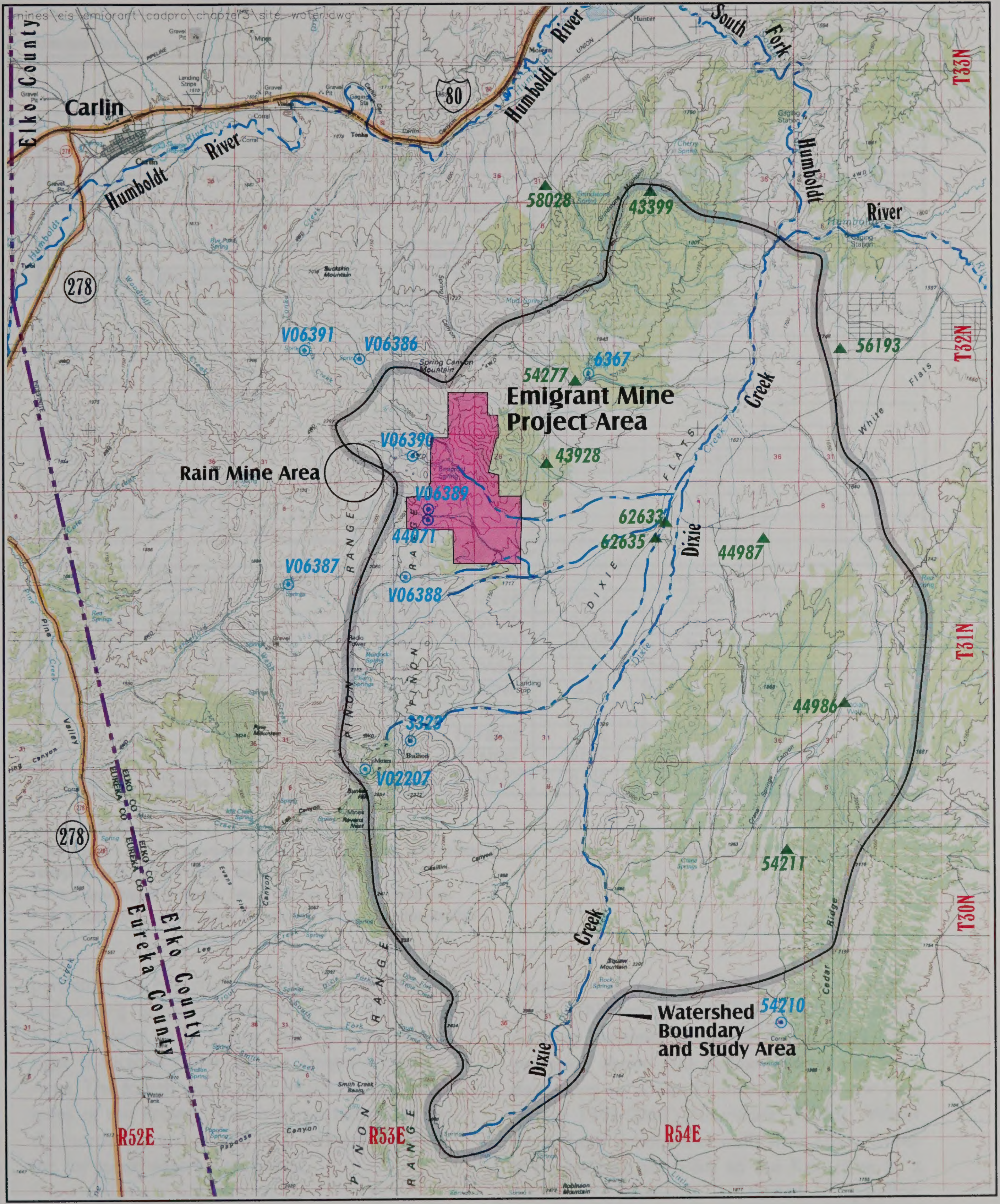
WATER USE

Water in the Study Area is used for wildlife, stock watering, mining/milling, irrigation, and domestic purposes. Locations of water right points-of-diversion are shown on **Figure 3-8**. Stock watering uses are scattered throughout the Dixie Creek Valley, whereas mining and milling uses are associated primarily with water supply wells located near Dixie Creek that supply water to the Rain Mine and would supply water to the Emigrant Project. The two domestic uses are located in the vicinity of Bullion in the southwest part of the Study Area. The Bartlett Decree of October 20, 1931 and the Edwards Decree of October 8, 1935 adjudicated water rights along Dixie Creek to the Cord Estate and J. Tomera Ranches Inc. (Seibert and Kiracofe 1988).

As of September 2004, eleven surface water and spring diversion water rights and ten groundwater rights are on record with the Nevada Division of Water Resources (NDWR) (**Table 3-15**). These include certificates, permits, and vested rights. Other historic water rights have been abandoned, cancelled, denied, revoked, or withdrawn. None of the water rights listed in **Table 3-15** are designated as Public Water Reserves (PWRs); however, some of the springs located on public land likely qualify as PWRs.

Not included in **Table 3-15** are decreed water rights for approximately 1,500 af/yr of irrigation water from Dixie Creek by Circle L Ranch. Eight surface water diversions permitted to J. Tomera Ranches Inc. for stock watering are located within a four-mile radius of the Emigrant Project Area (**Figure 3-8**). Two surface water diversions located approximately five miles south of the Project Area near Bullion are designated for domestic use.

Four groundwater rights are located within a four-mile radius of the Emigrant Project Area (**Figure 3-8**). Three of the four wells are



Basemap Source: Sure!MAPS RASTER 1:100,000 Nevada Map

N

0 Miles 3

POINT OF DIVERSION

- Stream or Spring
- Well

Water Rights
Emigrant Mine Project
Elko County, Nevada
FIGURE 3-8

TABLE 3-15
Water Rights in Emigrant Project Study Area

Water Right Number & Status[1]	Owner Name	Point of Diversion[2]	Diversion Rate (cfs)[3]	Water Use	Distance from Emigrant Project Area (miles)
Surface Water					
54210-cer	Elko Blacksmith Shop	T30N, R54E, Sec. 36 NWSE	0.008	Stock	12.5
3323-cer	James Burke	T31N, R53E, Sec. 34 NWSE	--	Domestic	4.25
6367-cer	J.T. Ranches	T32N, R54E, Sec. 20 SENW	0.003	Stock	2.0
44071-rfa	J.T. Ranches	T31N, R53E, Sec. 03 SESE	--	Stock	0.75
V02207-vst	Hesson, Hunter, & Hylton	T30N, R53E, Sec. 04 NENW	--	Domestic	5.75
V06388-vst	J.T. Ranches	T31N, R53E, Sec. 15 NENW	--	Stock	2.0
V06389-vst	J.T. Ranches	T31N, R53E, Sec. 03 NESE	--	Stock	0.75
V06390-vst	J.T. Ranches	T32N, R53E, Sec. 34 SWNE	--	Stock	0.75
V06386-vst	J.T. Ranches	T32N, R53E, Sec. 21 NWNE	--	Stock	2.5
V06391-vst	J.T. Ranches	T32N, R53E, Sec. 20 NENW	--	Stock	3.75
V06387-vst	J.T. Ranches	T31N, R53E, Sec. 18 LT01	--	Stock	4.0
Groundwater					
43928-per	Newmont Exploration	T32N, R54E, Sec. 31 LT04	--	Mining & Milling	1.0
44987-cer	BLM	T31N, R54E, Sec. 12 NENW	0.005	Stock	6.0
54211-per	Elko Blacksmith Shop	T30N, R54E, Sec. 12 SWSE	0.011	Stock	9.5
54277-per	BLM; Tomera	T32N, R54E, Sec. 20 SWSW	0.009	Stock	1.8
62633-per	Newmont Exploration	T31N, R54E, Sec. 03 SWSW	0.42	Mining & Milling	4.5
62635-per	Newmont Exploration	T31N, R54E, Sec. 09 SENE	0.84	Mining & Milling	3.5
44986-rfp	BLM	T31N, R55E, Sec. 30 NESE	0.006	Stock	8.5
56193-per	BLM	T32N, R55E, Sec. 19 NENE	0.006	Stock	7.5
43399-cer	J.T. Ranches	T33N, R54E, Sec. 33 NESE	0.016	Stock	5.75
58028-cer	Maggie Creek Ranch	T33N, R54E, Sec. 31 NWSE	0.025	Stock	4.75

Source: Nevada Division of Water Resources 2004.
[1] See **Figure 3-8** for locations of water rights. Status abbreviations: cer = certificate; vst = vested right; per = permit; rfa = ready for action; rfp = ready for action (protested).
[2] T = Township, R = Range, Sec. = Section, quarter sections.
[3] cfs = cubic feet per second. — indicates no information available.

permitted to Newmont Exploration for mining and milling purposes; two of these wells are located along Dixie Creek and the third water right is located closer to the Emigrant Project Area. The fourth water right located within four miles of the Project Area is about two miles to the northeast, and is held by J. Tomera Ranches Inc. for stock watering purposes.

The two water supply wells (RPW-1 and RPW-2) installed by Newmont for the Rain Mine in 1988 were periodically pumped at a maximum instantaneous rate of 1,500 gpm from 1988 to 2004 (Newmont 2004f). Highest annual pumping volumes occurred during 1988-1994, averaging about 100 million gallons per year, decreasing to about 15 million gallons per year during 1995-2004 (Newmont 2004d). Water from these production wells near Dixie Creek is transported six miles to the Rain Mine by a 12-inch diameter buried pipeline. Approximately 5 to 10 million gallons will continue to be pumped from these wells for the Rain Mine for about another five years.

SOIL RESOURCES

Information for soil resources in the Emigrant Project Area was obtained from the Order III Soil Survey of Elko County, Nevada, Central Part (USDA 1997) and an Order II Soil Survey conducted in the proposed disturbance areas by Maxim Technologies (2004a). These surveys were reviewed to identify existing soil for potential erosion hazards and general construction- and reclamation-related parameters. Distribution of soil map units within the Project Area is described in **Appendix B, Table B-1** and **Figure B-1**, respectively. Additional information concerning physical and chemical properties of soil in the Project Area was obtained from the Natural Resource and Conservation Service (NRCS).

Soil types in the Project Area are divided into two physiographic zones: 1) pediment surfaces in the southern portion of the Project Area near the proposed leach pad; and 2) steeply sloping terrain at the proposed mine site. Soil types in the leach pad area are comprised of loamy to silty loam surfaces with occasional clay loam subsurface underlain by indurated duripans at depths of approximately 24 inches. With the exception of terrace edges, this area is gently sloping with less than 15 percent surface coarse fragments. Clay-rich argillic horizons are only occasionally present. Soil at the proposed mine pit site is generally comprised of clayey surface textures with clay-rich subsoil. Soil in this area is shallow, includes bedrock outcrops, has a high percentage of coarse fragments, and is located on steep slopes.

Soil types throughout the Project Area exhibit low to very low permeability (often due to clayey subsurface soil textures) and exhibit rapid to very rapid surface runoff due to steep slopes. An exception to the surface runoff and drainage classes was encountered in soil map unit M located along perennial and ephemeral channels. Soil types in this map unit have moderate to moderately slow runoff and are moderately permeable.

Depth of soil varies throughout the Emigrant Project Area. Shallow soil, less than 20 inches to bedrock, and bedrock outcrops are found along weathered slopes and ridges in the mine portion of the Project Area. Shallow soil interspersed with moderately deep soil (20 to 40 inches) is also located along the western margin of the Project Area. Soil types are moderately deep to very deep over bedrock and have textures with high clay content.

Soil types encountered at lower elevations in the Project Area are dominated by duripans or weathered hardpans present approximately two feet below ground surface. The soil types on these pediments, alluvial fans, and terraces are most often without clay-rich argillic horizons. Deep to very deep soil, 60 inches or more, is found within the drainage bottoms and lower alluvial features and also only occasionally exhibit clay subsoil.

Restrictive properties of soil that affect suitability as growth media include physical or chemical characteristics that result in inhibition of plant growth or restrict soil structure development. Soil encountered in the Project Area generally contains low percentages of organic matter resulting in low fertility. Organic matter concentrations are generally at or less than three percent in the surface horizons and decrease quickly with depth. Other soil properties considered when determining use as growth medium include: coarse fragment content and size (greater than 3 inches in diameter) in the profile; high clay content; soil erodibility or K-factor; and depth to bedrock or duripan. Physiographic and non-soil features such as steep slopes, rough terrain, and rock outcrops would also limit the ability for equipment to salvage soil in these areas.

The ability of soil to support vegetation varies throughout the area. On some soil, vegetation is relatively easy to establish and maintain, the surface is stable and resists erosion, and the reconstructed soil has good potential productivity. Others can be vegetated and stabilized by modifying one or more properties. Laboratory analytical data did not indicate soil chemistry would interfere with revegetation success. However, soil types in this region generally exhibit low concentrations of organic matter and resultant nutrient availability.

Shallow depth to a restrictive layer, high clay content, and coarse fragments are the common limiting characteristics of soil in the Project Area. Eight soil map units (approximately 173 acres) in the area are not suitable for opportunistic salvage due to shallow soil and high concentrations of coarse fragments. Ten soil map units (approximately 557 acres) rate as "poor" overall. The remainder of footprint acreage (626 acres) rate fair for salvage potential. Portions of Map Units M and I have surface horizons with sufficient organic matter composition and other characteristics to rate as "good" for growth medium potential.

Information on each soil family, including percent of soil series included in each mapping unit, slope range, landform, depth to induration or bedrock, rooting restricting depth, permeability, available water holding capacity, surface runoff class, hydrologic group, and erosion hazard potential, is contained in Soil Survey of Elko County, Nevada, (USDA 1997). Additional details on soil family designations are presented in the Order II Soil Survey (Maxim 2004a). Soil suitability class and salvage depths are contained in **Appendix B, Table B-2**.

SOIL EROSION HAZARD

The rate of soil erosion (undisturbed soil conditions) is dependent primarily on slope, soil surface texture, and soil surface cover. The NRCS rates suitability of in-situ soil for potential erosion hazards of water and wind. NRCS erosion hazard ratings for soil in the Emigrant Project Area are summarized in the referenced USDA Soil Survey (USDA 1997) and the Order II Soil Survey (Maxim 2004a).

Watershed sediment yield for the Project Area using data presented by the NRCS was calculated by Simons & Associates (2004). The data presented in this report are based on various storm intensities under current site conditions. Calculations were made for five sub-basins in the Project Area that have drainage areas ranging from 0.15 to 2.23 square miles. Results show that fine sediment yield for each of the sub-basins is in the range of 9 to 33 tons for the 10-year storm event, and 25 to 162 tons for the 100-year storm event (Simons & Associates 2004). These values are for fine-grained suspended sediment (wash load) and do not include coarse-grained bed load. Total sediment yield, including both fine- and coarse-grained sediment is estimated to be about 1.33 times the fine sediment load values presented above (Simons & Associates 2004).

The hazard of water erosion ranges from slight to high within the Project Area. Soil types in the northern portion of the Project Area rate moderate due to steep, long slopes. However, the high percentage of coarse fragments on the surface, and generally clayey textures, mitigate these values under existing conditions. Water erosion values in lower elevations of the southern Project Area generally rate as moderate to high, due primarily to silt and very-fine sand content. Mitigating factors in this area include the generally gentle terrain.

The wind erosion hazard is generally low to moderate due to predominance of surface rock fragments which reduces susceptibility to wind entrainment. Clayey surface textures occur at many locations throughout the Project Area which reduces susceptibility to wind erosion. Exceptions include localized very fine sand and silt loam surfaces encountered on pediment surfaces.

Potential sediment yield from proposed mine area slopes associated with the Emigrant Project were estimated using the Water Erosion Prediction Project (WEPP) model. The model predicts sediment yield from hill slopes based on site physical parameters including soil type, slope length and grade, precipitation, and vegetation. Mean annual sediment yield modeled for pre-mining conditions ranged from 0.021 to 0.188 tons per acre (Maxim 2005). The mean annual sediment yield predicted above is that sediment volume that may occur at the toe of slopes within the area of proposed disturbance. It is not the volume of sediment that can be expected to occur at a particular point in a stream or channel within the area of interest. Transport capacity of channels, flow velocity in channels, deposition within channels, and other factors influence the portion of the hill slope sediment yield that may be transported to a particular point in a stream or channel or would be collected in a sediment pond or trap.

VEGETATION

The Study Area for vegetation resources is the proposed mine permit area.

PLANT COMMUNITIES

The dominant vegetation in the Study Area is characterized by big sagebrush and grassland communities and juniper woodlands (Westech 2004a). Springs and seeps, although comprising a small part of the Study Area, provide riparian habitat that support a diversity of species not found on drier upland sites. Following fire, non-native cheatgrass has become invasive on some sites, and is a dominant herbaceous species on many sites. A vegetation map and list of common and scientific plant names identified in the Study Area are presented in **Appendix C**.

LOW SAGEBRUSH (*ARTEMISIA ARBUSCULA*) COMMUNITY (340 ACRES)

The low sagebrush community is a common type scattered throughout the Study Area. It occurs on shallow, rocky soil of variable aspect, frequently on ridges. It is generally found on convex to straight topography with gentle to moderate slope (up to 30%).

Because of low vegetation cover creating low fuels for fire, and high bare ground (average 49%) and rock cover (30%), previous fires have not burned some low sagebrush stands and these stands occur as isolated islands of unburned vegetation within burned areas.

Total vegetation cover averages 35 percent. Low sagebrush dominates the type with cover between 15 and 25 percent; averaging about 22 percent. Other shrubs are generally not present in this type except for an occasional green rabbitbrush. Perennial grasses average 11 percent cover of which Sandberg's bluegrass is dominant. On drier, lower elevation sites, bottlebrush squirreltail and bluebunch wheatgrass are common associates. On upper elevation sites with northerly or easterly aspects, Idaho fescue is present.

Perennial forbs average about 5 percent cover with Stansbury phlox, western hawksbeard and Douglas draba being common. Annual grasses and annual/biennial forbs are not a conspicuous component of the low sagebrush vegetation type.

BURNED LOW SAGEBRUSH (*ARTEMISIA ARBUSCULA*) COMMUNITY (145 ACRES)

The burned low sagebrush community occupies sites similar to its unburned counterpart, primarily convex to straight ridges and slopes with shallow, rocky soil. Since the low sagebrush type occurs interspersed with the mountain big sagebrush type and, to a lesser extent, with the basin big sagebrush type, mapping type boundaries where the area has burned is difficult and the burned low sagebrush type was frequently mapped as a mosaic of two burned sagebrush types.

Total vegetation cover at 33 percent is quite similar to the unburned low sagebrush type at 35 percent, however, cover by morphological class varies considerably between burned and unburned stands.

Shrub cover is only 3 percent on burned sites compared to 22 percent on unburned areas. Low sagebrush and mountain big sagebrush each have 1 percent cover in the burned plot sampled. Mountain big sagebrush appears to be a seral species occupying burned low sagebrush sites apparently establishing more rapidly than low sagebrush.

Grass cover is higher on burned sites at 25 percent, compared to 11 percent on unburned sites. Dominant grasses include Sandberg's bluegrass (15%), bottlebrush squirreltail (8%),

and bluebunch wheatgrass (2%). Perennial forb cover is slightly higher on burned sites at 8 percent compared to 5 percent on unburned areas. Stansbury phlox is the dominant forb.

In contrast to other burned sagebrush types, annual grasses and annual/biennial forbs are not a conspicuous component of the burned low sagebrush type. This is likely due to the minor presence of these increaser species in the unburned low sagebrush type.

MOUNTAIN BIG SAGEBRUSH (*ARTEMISIA TRIDENTATA SSP. VASEYANA*) COMMUNITY (138 ACRES)

The unburned mountain big sagebrush community is a minor type in the western and northern portions of the Study Area, primarily because most of the type has been burned. It is found on shallow to deep soil on variable aspects and slope configurations. It occurs on moderately steep, to steep slopes.

Total vegetation cover is about 42 percent of which shrubs represent 25 percent. Mountain big sagebrush provides 20 percent cover with green rabbitbrush at 5 percent cover. Perennial grass and forb cover varies considerably depending on slope, aspect and soil. The site sampled has 10 percent cover of perennial grasses and 11 percent cover of perennial forbs. Moister sites on northerly and easterly aspects have higher herbaceous cover. Dominant grasses on drier sites include Sandberg's bluegrass and bluebunch wheatgrass, while moister sites have higher cover of Idaho fescue. Common forbs include spurred lupine and Stansbury phlox.

BURNED MOUNTAIN BIG SAGEBRUSH (*ARTEMISIA TRIDENTATA SSP. VASEYANA*) COMMUNITY (636 ACRES)

The burned mountain big sagebrush community is an extensive type covering expansive areas in the western portion of the Study Area. It frequently occurs with the burned low sagebrush vegetation type and is often mapped as a mosaic of the two types.

Total vegetation cover averages 29 percent compared to 42 percent for unburned sites. Shrub cover is low at 9 percent compared to 25 percent cover in an unburned stand. Green rabbitbrush is the dominant shrub in most burned mountain big sagebrush areas and, in some areas, is abundant enough to constitute a green rabbitbrush seral community. Mountain big sagebrush is present in most burned areas although cover is generally low.

Perennial grass cover is 8 percent, slightly lower than the 10 percent recorded in an unburned stand. Dominant grasses include Sandburg's bluegrass, bluebunch wheatgrass, Idaho fescue, and bottlebrush squirreltail. Perennial forb cover is also slightly lower in burned stands at 8 percent compared to 11 percent in the unburned plot. Annual grass and annual/biennial forb cover totals 6 percent compared to less than 1 percent in the unburned plot. Species that have increased following fire include cheatgrass, autumn willow-herb, tumblemustard, prairie pepperweed, and fireweed fiddleneck.

BASIN BIG SAGEBRUSH (*ARTEMISIA TRIDENTATA SSP. TRIDENTATA*) COMMUNITY (540 ACRES)

The basin big sagebrush community is the dominant unburned vegetation type in the southern portion of the Study Area. It occurs in valley bottoms and on terraces, benches, and

gentle to moderately steep slopes generally on deeper soil. Elevation ranges from 5,640 to 6,500 feet although the type extends to higher elevations (6,800 feet) in swales with deeper soil and increased moisture. Configuration is generally straight or concave and aspect is variable.

Total vegetation cover of this community is 50 percent. Basin big sagebrush dominates with 35 percent cover. In valley bottoms with deeper soil, shrub height averages 4 to 6 feet; on less productive sites, shrub height decreases to 3 to 4 feet. Scattered Utah juniper is present in some stands.

Common understory species include bottlebrush squirreltail, Sandberg's bluegrass, basin wildrye, Thurber needlegrass, and spreading phlox. Because this type occurs on gentle slopes, benches and valley bottoms easily accessible to cattle, livestock use is prevalent. Perennial grasses have low cover with corresponding increases in annual and biennial forbs and grasses. With increasing elevation the basin big sagebrush vegetation type integrates with the mountain big sagebrush vegetation type forming a zone where both species occur.

BURNED BASIN BIG SAGEBRUSH (*ARTEMISIA TRIDENTATA SSP. TRIDENTATA*) COMMUNITY (810 ACRES)

The basin big sagebrush community is highly flammable and large areas of the type have burned during the past 5 to 15 years. The burned basin big sagebrush vegetation type is extensive throughout the Study Area covering broad expanses in the southern portion and occurring along drainages and moist microsites in the northern and central portions of the Study Area.

Vegetation composition is variable depending on age of burn, fire intensity and site conditions. Because the basin big sagebrush type occurs on more productive sites, shrub reestablishment occurs fairly rapidly. Total vegetation cover for this community averages 31 percent compared to 50 percent in an unburned stand. Stands sampled have shrub cover from 5 to 19 percent averaging 13 percent. Basin big sagebrush is the dominant shrub averaging 10 percent cover, with green and rubber rabbitbrush at average cover of 2 and 1 percent, respectively. In some areas, especially older burns, green and rubber rabbitbrush have become well established, forming a seral rabbitbrush vegetation type. Dominant understory species include Sandburg's bluegrass, basin wildrye, bottlebrush squirreltail, and clasping pepperweed. Portions of the burned basin big sagebrush vegetation type were seeded with the exotic crested and intermediate wheatgrass and these species are well established in some areas of the burn.

Annual grasses and forbs are a conspicuous component of the burned type with cheatgrass cover quite high in some areas. Other common annuals in burned basin big sagebrush include clasping pepperweed, desert alyssum, and alfilaria.

MIXED SHRUB (*ARTEMISIA* SP., *PURSHIA TRIDENTATA*, *CHRYSOTHAMNUS* SP.) COMMUNITY TYPE (140 ACRES)

The mixed shrub community is common, primarily in the northern half of the Study Area, and is found at mid to upper elevations on sites with variable aspect, configuration, and soil. This type is characterized by a mix of two or more sagebrush species and green rabbitbrush. Antelope bitterbrush is a diagnostic species for the mixed shrub vegetation type and was used in mapping to differentiate mixed shrub from the floristically similar mountain big sagebrush type.

Total vegetation cover averages about 42 percent. Shrubs dominate the type with 28 percent cover. Sagebrush species are

conspicuous with mountain big sagebrush at 10 percent, low sagebrush at 6 percent, and basin big sagebrush at 5 percent. Antelope bitterbrush averages 5 percent and green rabbitbrush has 3 percent cover.

Perennial grasses average about 8 percent cover with 1 to 2 percent cover provided by bottlebrush squirreltail, Sandberg's bluegrass, bluebunch wheatgrass, basin wildrye, and Idaho fescue. Perennial forbs average 6 percent cover and include western hawksbeard, arrowleaf balsamroot, and spurred lupine, each averaging 1 to 2 percent cover.

BURNED MIXED SHRUB (*ARTEMISIA* SP., *PURSHIA TRIDENTATA*, *CHRYSOTHAMNUS* SP.) COMMUNITY (80 ACRES)

Burned mixed shrub is a common type at mid to upper elevations throughout the Study Area. Floristically it is very similar to the burned mountain big sagebrush type, except that basin big sagebrush and occasionally low sagebrush are reestablishing in burned areas.

Total vegetation cover averages about 30 percent, substantially less than the 42 percent cover in the unburned counterpart. Perennial forbs and shrubs each average about 12 percent cover. Common forbs include spreading phlox, arrowleaf balsamroot, and spurred lupine. Shrubs exceeding 1 percent include green rabbitbrush, basin big sagebrush, and mountain big sagebrush. Fire has effectively eliminated antelope bitterbrush in most of this community. Annual grass and annual/biennial forb cover is not substantially different between burned and unburned sites.

JUNIPER WOODLAND (*JUNIPERUS OSTEOSPERMA*) COMMUNITY (364 ACRES)

The juniper woodland vegetation type is common in the east-central portion of the Study Area and as smaller stands in the southern portion of the Study Area. It was more extensive prior to large fires. This community typically occurs on shallow, rocky soil generally with moderately steep-to-steep, variable-aspect slopes. On more gentle slopes with deeper soil, Utah juniper occurs as more widely spaced trees with basin big sagebrush forming a juniper/basin big sagebrush subtype.

On very steep, lower slopes above drainage bottoms, some sites are essentially barren. Total vegetation cover is 37 percent, comprised primarily of Utah juniper at 25 percent cover and singleleaf piñon having 1 percent cover. Perennial grasses are generally sparse, averaging only 5 percent cover. Although numerous grass species were recorded in this community, only basin wildrye and Sandberg's bluegrass averaged more than 1 percent cover.

Perennial forbs averaged about 7 percent cover with composition and cover highly variable. One site on a limestone ridge has 17 percent cover by 10 species, while two sites on differing substrates have 1 to 3 percent cover with much lower diversity. Annual grasses and annual/biennial forbs each average less than 1 percent cover.

Shrub cover is also variable among stands with essentially no shrubs in some areas, especially very steep southern exposures. On more level sites with deeper soil, basin big sagebrush is abundant. At mid to upper elevations, mountain big sagebrush and antelope bitterbrush are present although cover is generally low.

BURNED JUNIPER WOODLAND (*JUNIPERUS OSTEOSPERMA*) COMMUNITY (492 ACRES)

Large portions of the juniper woodland in the east central and southwestern portions of the

Study Area have burned. Total vegetation cover is much reduced in burned areas at 21 percent compared to 37 percent in unburned areas. The primary difference is the almost total lack of trees in burned stands with tree cover at only about 1 percent in burned areas, while unburned areas average 26 percent tree cover. Some regeneration of Utah juniper is present, however, especially peripheral to unburned areas or where isolated, seed-producing junipers were missed by fire.

Perennial grass cover is comparable between burned and unburned stands with both averaging about 5 percent cover. Sandberg's bluegrass, bottlebrush squirreltail, basin wildrye, and bluebunch wheatgrass each average 1 to 2 percent cover in burned juniper woodland. Perennial forb cover is somewhat lower in burned areas averaging 4 percent cover compared to 7 percent cover in unburned areas. Perennial forbs averaging about 1 percent cover in burned juniper woodland include spurred lupine, pointed cryptantha, and spreading phlox.

Annual grass and annual/biennial forbs are more prevalent in burned areas totaling about 5 percent cover compared to only 1 percent cover in unburned stands. Cheatgrass is the dominant annual increaser in the burned area.

Average shrub cover also increased in burned juniper woodland to about 8 percent, while sampled unburned stands average only 2 percent cover. Basin big sagebrush and green rabbitbrush have generally increased post-burn. Shrub response, however, is variable between burned areas with some sites having low shrub cover and other sites with much higher shrub cover.

INVASIVE, NON-NATIVE SPECIES

Noxious weeds are defined under Nevada law (NRS 555.005) and the federal Noxious Weed Act of 1974, amended by Section 15 of the U.S. Farm Bill, Management of Undesirable Plants on Federal Lands, as any species of plant that is or is likely to be detrimental or destructive and detrimental to control or eradicate. Noxious weeds are damaging to the environment and local economy, and replace desirable vegetation. Often noxious weeds proliferate where native vegetation has been removed or disturbed.

Forty-four species of noxious weeds have been identified in Nevada (NRS 555.101). Common species in Elko County include leafy spurge (*Euphorbia esula*), Scotch thistle (*Onopurdum acantheum*), tall pepperweed (*Lepidium latifolium*), musk thistle (*Carduus nutans*), spotted knapweed (*Centaurea maculosa*), Russian knapweed (*Centaurea repens*), hoary cress (*Cardaria draba*), and Dyer's woad (*Isatis tinctoria).*

Two noxious weed species were found in the Study Area: Scotch thistle and hoary cress. Scotch thistle is abundant along the Rain Mine pipeline/powerline corridor through the Study Area and along the road to Emigrant Spring. It is common along other roads, exploration trails, and drill sites. Scotch thistle is spreading substantially into adjacent native vegetation, especially burned areas. This species was observed several hundred feet from the Emigrant Spring road and throughout the basin big sagebrush and burned basin big sagebrush vegetation types along the main drainage in the Study Area.

Hoary cress was reported by EIP Associates (1997) for the Study Area based on field work conducted in 1993. Hoary cress was recorded on the drainage below Emigrant Spring just upstream from where the drainage crosses the main north/south road through the Study Area. This population was not found in August 2004.

Perennial pepperweed (*Lepidium latifolium*) was observed on the Bullion Road between Carlin

and the Study Area, but no populations were found within the Study Area. Likewise, knapweed species and leafy spurge were not observed in the Study Area. Cheatgrass is present in small amounts in the Study Area.

SPECIAL STATUS PLANT SPECIES

The Study Area for Special Status Plants is the proposed mine permit area. There are no plants listed as threatened or endangered under the Endangered Species Act of 1973 known or with the potential to be present in the Study Area (Cedar Creek Associates 1997); however habitat for the nine plants listed as sensitive by BLM may be present in the Study Area (**Table 3-16**).

Searches of the Study Area found no sensitive species (Westech 2004a). Four cactus populations were found during the survey. Two populations are *Pediocactus simpsonii var. simpsonii* and two are *Opuntia erinacea var. erinacea*. A Nevada Native Species Site Survey Report was completed and submitted for these populations. All cacti are protected by Nevada state law (NRS 527.060-.120).

Habitat for wooly fleabane and Lewis buckwheat may be present at the highest elevations of the Study Area. Habitat for Elko rockcress, Osgood Mountain milkvetch, grimy mousetail, and Leiberg clover may be present on rock outcrops and gravelly deposits. Habitat for Owyhee prickly phlox may be present on steep cliffs and canyon walls. Habitat for Meadow Pussytoes and least phacelia may be present around seeps and springs. Searches of the Study Area did not find these species (Cedar Creek Associates 1997; Westech 2004a).

TABLE 3-16
Sensitive Plants with Suitable Habitat in Study Area

Common Name	Scientific Name	Habitat
Meadow Pussytoes	*Antennaria arcuata*	Sparsely vegetated seasonally dry seeps, springs and parts of moist alkaline meadows.
Elko rockcress	*Arabis falcifructa*	Dry, densely vegetated, relatively undisturbed soils with soil crust, in sagebrush communities; 5300-6100 feet elevation.
Osgood Mountains milkvetch	*Astragalus yoder-williamsii*	Dry, open granodiorite soils in sagebrush communities; 5660-7300 feet elevation
Wooly fleabane	*Erigeron lanatus*	Alpine and subalpine talus slopes
Lewis buckwheat	*Eriogonum lewisii*	Dry open ridges in central Nevada at elevations 6470-9720 feet
Grimy mousetail	*Ivesia rhypara* var. *rhypara*	Dry, barren outcrops and badlands, cobbly riverbed deposits, and shallow gravel, 5370-6200 feet elevation
Owyhee prickly phlox	*Leptodactylon glabrum*	Crevices in steep to vertical canyon walls; 4710-5300 feet elevation.
Least phacelia	*Phacelia minutissima*	Vernally saturated, sparsely vegetated swales in sagebrush zone; 6240-8900 feet elevation
Leiberg clover	*Trifolium leibergii*	Dry, shallow, barren soils of crumbling volcanic outcrops, mostly on upper slopes at elevations of 6560-7800 feet.

WETLAND/RIPARIAN AREAS

The Study Area for Wetland/Riparian Areas includes the mine permit area and portions of ephemeral drainages west of the permit boundary that flow through the mine permit area (**Figure 3-9**).

WETLANDS AND NON-WETLAND WATERS

Waters of the U.S. include all drainages (perennial, ephemeral, and intermittent) with a defined bank and bed (i.e., non-wetland waters), and jurisdictional wetlands associated with springs and drainages.

Wetlands are regulated under Section 404 of the Clean Water Act as a subset of Waters of the U.S. Wetlands are defined as areas that are inundated or saturated by surface water or groundwater at frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions (U.S. Army Corps of Engineers 1987). Jurisdictional wetlands are wetlands that are contiguous with interstate waters (i.e., not isolated). Isolated wetlands not connected with interstate waters are not jurisdictional.

Wetlands in the Study Area are associated with springs/seeps and perennial and intermittent drainages. Wetland surveys delineated 3.9 acres of jurisdictional wetlands and 3.0 acres of non-wetland Waters of the U.S. in the Study Area (**Figure 3-9**) (Westech 2004b). Eight springs or seeps were identified within the Study Area (**Figure 3-9**). Springs and seeps discharge to the three ephemeral drainages that drain the east flank of the Piñon Range, cross the Study Area, and eventually are confluent with Dixie Creek. The northern-most two drainages converge into a single channel near the western side of the proposed disturbance boundary (**Figure 3-9**). Portions of these two channels have perennial flow due to discharge from several springs and seeps near the western permit boundary (**Figures 3-5** and **3-9**).

Herbaceous wetland vegetation is associated with springs/seeps and larger drainages where seasonal flow is augmented by upstream springs. Drainages supporting wetland vegetation are flooded or saturated during spring runoff through the middle of the growing season. Wetlands are restricted to the banks and lowest stream terraces and are generally only a few feet wide. With increasing distance below the springs, wetland vegetation becomes intermittent and disappears as stream flow enters alluvium.

Dominant wetland and/or riparian plants include Baltic rush, dagger-leaf rush, Nebraska sedge, redtop, Kentucky bluegrass, cow clover, Rocky Mountain buttercup, curly dock, common dandelion, and common plantain. Riparian vegetation along drainages downstream from the herbaceous wetlands is composed mostly of upland species, usually basin big sagebrush.

The two northern-most drainages along the west side of the Study Area contain the most wetlands. The primary source of water for these wetlands is several springs/seeps in the drainage bottoms (springs/seeps A-1, A-2, B-1, B-2, & B-3; **Figure 3-9**). These wetlands support cattails, bulrush, and other species adapted to saturated soil conditions. Woody vegetation such as willows and wild rose are sparse. Shrubs only exist where cattle have been fenced out of the wetland area around Emigrant Spring (spring B-1; **Figure 3-9**). Heavy livestock use has limited development of woody wetland vegetation (EIP Associates 1997; Cedar Creek Associates 1997).

RIPARIAN AREAS

Riparian areas are the vegetated areas bordering springs, streams, and other bodies of water and include wetlands, stream channels, and vegetation adapted to soil and moisture conditions transitional between uplands and wetlands. The extent to which riparian areas perform ecological functions is determined by hydrological, vegetational, and erosional features of a riparian system such as flood frequency, sinuosity, width/depth ratios, gradient, and riparian zone width. Vegetation attributes include composition, age structure, indicator species, root masses, bank cover, vigor, and woody debris recruitment potential. Erosion attributes include floodplain and channel characteristics, point bar cover, lateral stream movement, stability, and water/sediment balance.

Riparian areas in the Study Area generally are heavily grazed by livestock and exhibit the following indications that they are not functioning optimally:

- High stream flows cause erosion and elevated sediment load;
- Insufficient riparian vegetation to capture bedload and contribute to floodplain development;
- Inadequate vegetation to improve flood-water retention and groundwater recharge;
- Inadequate root masses to stabilize stream banks;
- Noxious weeds proliferating along some riparian reaches;
- Large unstable sediment deposits in the channel bottom; and
- Unstable and poorly vegetated stream banks.

FISHERIES AND AQUATIC RESOURCES

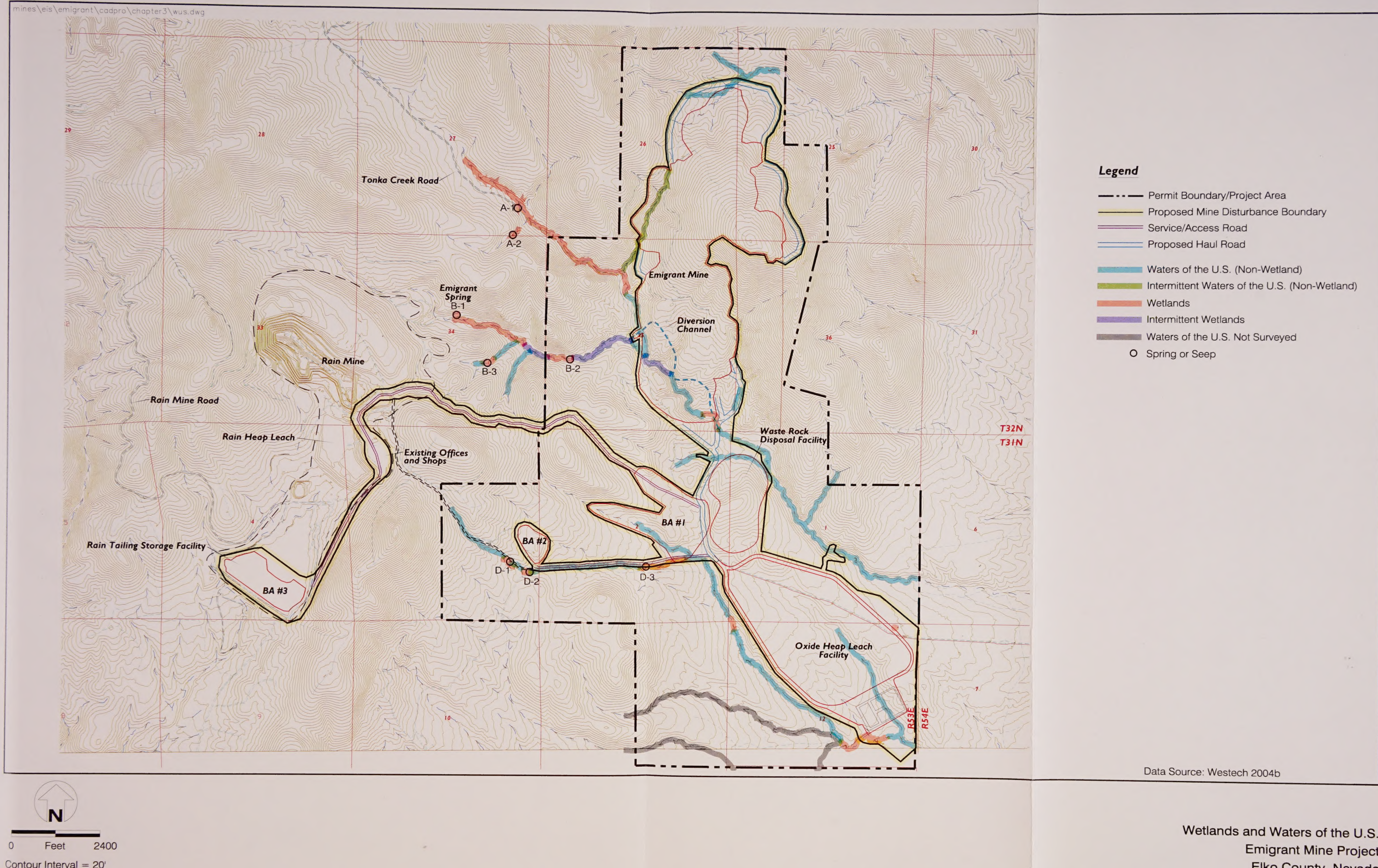
The fisheries and aquatic resources Study Area for this analysis includes the Project Area, drainages immediately adjacent to and flowing into the Project Area, and Lower Dixie Creek below its confluence with drainages exiting the Project Area to the mouth of the South Fork Canyon (including portions of South Fork Humbolt River below its confluence of Dixie Creek).

EXISTING CONDITIONS

Most of the Emigrant Project Area is drained by two channels that extend eastward from the Piñon Range through the Project Area and eventually join Dixie Creek approximately five miles east of the Project Area (**Figure 3-5**). The northern tributary channel trends through the proposed mine pit area, whereas the southern channel is located immediately west and south of the proposed heap leach facility.

Both channels west of the proposed mine pit area contain flow most of the year owing to the presence of several seeps and springs in the drainage bottoms, the most prominent of which is Emigrant Spring, located in the upper end of a tributary channel west of the proposed mine pit area (**Figures 3-5** and **3- 9**). Flow in the drainages often disappears a short distance below the springs and seeps except during periods of snowmelt and major rain events. Both drainages trending through the Project Area eventually join the lower reach of Dixie Creek. This reach of Dixie Creek is typified by discontinuous flow, maintaining continuity to its confluence with South Fork Humboldt River seasonally during snowmelt or runoff events.

Lahontan cutthroat trout (*Onchorynchus clarki henshawi*), a federally listed threatened species, occurs in the upper reaches of Dixie Creek. Refer



Wetlands and Waters of the U.S.
Emigrant Mine Project
Elko County, Nevada
FIGURE 3-9

to the *Special Status Wildlife Species* section in this chapter for further discussion.

FISHERIES

Between 1957 and 2003, numerous fish population surveys were conducted in the vicinity of the proposed Project Area by the Nevada Department of Wildlife (NDOW). These studies assessed fisheries in the South Fork Humboldt River and Dixie Creek. SWCA (2004) conducted a survey of approximately seven miles of Dixie Creek upstream from the confluence of South Fork Humboldt River. Maxim (2004b) conducted a fisheries survey of the northern tributary channel in the Project Area. A summary of these surveys and previous surveys identifying fish presence in the vicinity of the Project Area is presented in **Table 3-17**.

Project Area Drainages

Until 2004, indications were that no fish were present in the northern tributaries transecting the Project Area. Maxim (2004b) identified two fish species in this northern drainage during August 2004 in an approximately 1-mile reach of stream from below Emigrant Spring to below the confluence of the two forks comprising the northern drainage system (**Figure 3-9**). Lahontan speckled dace and Lahontan redside shiner were collected at eight locations within this area. The channel below this area was dry at the time of field observation, as was the southern drainage within and near the Project Area.

TABLE 3-17
Results of Fisheries Surveys in the Study Area

Stream	Agency	Year	Species Present
South Fork Humboldt River	NDOW	1996 1999 2003	Smallmouth bass (*Micropterus dolomieu*) Brown trout (*Salmo trutta*) Rainbow/cutthroat hybrids Cutthroat trout (*Oncorhynchus clarki*)[1] Rainbow trout (*Oncorhynchus mykiss*) Lahontan speckled dace (*Rhinichthys osculus*) Lahontan redside shiner (*Richardsonius egregious*) Lahontan mountain sucker (*Catostomus platyrhynchus*) Tahoe sucker (*Catostomus tahoensis*) Tui Chub (*Gila bicolor*)
Lower Dixie Creek	NDOW	1997	Lahontan mountain sucker Tahoe sucker Lahontan speckled dace
Lower Dixie Creek	SWCA	2004	Lahontan speckled dace Lahontan redside shiner Tahoe sucker
Project Area Drainage Tributary to Dixie Creek	Maxim Technologies	2004	Lahontan speckled dace Lahontan redside shiner

[1] Note: Cutthroat trout present in South Fork Humboldt River are from hatchery sources and are not included in populations targeted for recovery under the 1995 Lahontan Cutthroat Trout Recovery Plan.

Lower Dixie Creek

SWCA (2004) completed a survey that concentrated on searching for cutthroat trout and/or nonnative salmonids entering lower Dixie Creek from South Fork Humboldt River as nonnative salmonids could threaten the pure Lahontan cutthroat trout population in Upper Dixie Creek. Investigators during this study identified several fish species in the reach of the stream between its confluence with South Fork Humboldt River to a point approximately seven miles upstream. Identified species included Lahontan speckled dace, Lahontan redside shiner, and Tahoe sucker. Larvae of all three species were found, indicating that lower Dixie Creek supports self-sustaining populations of these native fishes. Although not documented, Elliott (2004) suggests Lahontan cutthroat trout could enter Lower Dixie Creek from South Fork Humboldt River by an individual drifting down from the South Fork Humboldt River dam or as the result of downstream drift from Upper Dixie Creek during periods when flow is present throughout the Dixie Creek drainage.

The USGS hydrograph from 1989-1996 (**Figure 3-6**) shows that lower Dixie Creek becomes intermittent in late summer, which limits trout habitat (see *Water Quantity and Quality* section). In addition, SWCA (2004) indicated there was no recent evidence of spawning by trout in lower Dixie Creek, presumably because of the stream's intermittent nature. However, resting and feeding habitats were identified by SWCA, beginning about three miles upstream from the confluence of Dixie Creek and South Fork Humboldt River. In this location, which is approximately five miles upstream, BLM has fenced Dixie Creek to restrict cattle access and has reduced the frequency and duration of hot season livestock grazing in the area. This action has revegetated the riparian area and is providing water quality benefits such as lower stream temperatures and sediment retention (Evans 2004). Additionally, perennial reaches in this area (**Figure 3-5**) allows for year-round presence of aquatic life (fish, macro-invertebrates and periphyton), small mammals, birds, reptiles and amphibians, and a variety of other species that utilize riparian habitat.

MACROINVERTEBRATES

Limited data concerning macroinvertebrates in and around the Project Area are available. Therefore, in conjunction with the fisheries survey conducted by Maxim (2004b), aquatic macroinvertbrate samples were collected at three locations in the channel below Emigrant Spring near the proposed mine site using the U.S. Environmental Protection Agency (EPA) Rapid Bioassessment Macroinvertebrate Protocol described in Barbour *et al.* (1999). Collected macroinvertebrate samples were analyzed by a laboratory to identify species, relative abundance, number of taxa, dominant taxa, and percent dominant taxa. Further analyses were performed to calculate biotic integrity indices, ratios of functional groups (scraper, shredder, and filtering taxa), ratios of Ephemeroptera (mayflies), Plecoptera (stoneflies), Trichoptera (caddisfly), and Chironomidae (midges) taxa (EPT), tolerance quotients, tolerance values, and community similarity indices. Detailed results regarding these metrics are found in the Baseline Technical Report – Fisheries and Aquatic Resources (Maxim 2004b).

Results of the macroinvertebrate survey (**Table 3-18**) indicate poor or stressed water quality conditions are present at all sites sampled within the channel that contains Emigrant Spring. The Shannon-Weaver index, which evaluates effects of stress on aquatic communities of invertebrates (Klemm *et al.* 1990), displayed scores below 1.0 at all sites. This index generally has values ranging from 0 to 4.0, with values less than 1.0 indicating severe stress, and values greater than 2.5 indicating a healthy invertebrate population. The low scores likely reflect degraded stream and riparian habitat conditions.

TABLE 3-18
Macroinvertebrate Data Summary
Emigrant Project

Site	Corrected Abundance (# ind/m²)	Dominant Community Composition (% Order)	Dominant EPT Taxa (% Order)	Richness (# species)	Shannon-Weaver Index (H')	Dominant FFG (% FFG)
Emigrant Spring Creek 1	1776	5.07 Diptera	2.70 Ephemeroptera	15	0.27	94.82 Gatherers
Emigrant Spring Creek 2	596	35.57 Diptera	1.17 Ephemeroptera	16	0.67	81.88 Gatherers
Emigrant Spring Creek 3	1617	42.8 Diptera	4.02 Ephemeroptera	26	0.81	61.41 Gatherers

Source: Maxim 2004b.
Notes: #ind/m² = number of individuals per square mile; EPT = Ephemeroptera-Plecoptera-Trichoptera; FFG = Functional Feeding Group.

TABLE 3-19
Summary of Stream Channel Habitat Conditions
Emigrant Project

Site ID	Reach 1[3]	Reach 2	Reach 3
Width/Depth Ratio	7.46	4.94	4.65
Wetted Width (cm)	72.64	82.80	60.34
Bankfull Width (cm)	371.35	219.96	173.73
Streambank Condition[1]	36.67	67.50	51.67
Channel Characteristics[2]	G4	G4	G4
Bed-form Type	Alluvial Pool, Riffle	Alluvial Pool, Riffle	Alluvial Pool, Riffle

Source: Maxim 2004b.
1 Estimates percent (%) of lineal distance eroding at the active channel height on both sides of a transect.
2 According to Rosgen (1996).
3 Reach 1 was within a fenced enclosure around Emigrant Spring, Reaches 2 and 3 were outside and downstream of the enclosure.

HABITAT

Maxim (2004b) conducted habitat surveys at three locations on the northern tributary channel within and near the Project Area where fish were observed and captured. The habitat surveys conducted were primarily qualitative and included an assessment of channel dimensions, riparian condition, and pool conditions. Results of the surveys are summarized in **Table 3-19**.

The habitat of the drainage hosting Emigrant Spring has been created by highly variable seasonal flow and has been impacted by stream bank trampling by livestock. The G4 channel type (Rosgen 1996) consisted of boulders, cobbles, and gravel and silts. In general, the reaches evaluated were determined to consist of stable meanders with low-gradient riffle-pool morphology. Pools were typically of the straight or lateral scour type, the later formed by the influence of boulders present within the bankfull-width of the channel. The large woody debris recruitment potential was observed to be low to nonexistent. This drainage exhibits a sensitive, degrading channel subject to extremely variable seasonal flows with highly erodible stream banks. Outside of the fenced livestock enclosure around Emigrant Spring, there is a greater potential for high erosion rates.

Riparian vegetation consisted of various shrubs and grasses within the enclosure (Reach 1), which often provided cover for aquatic life. Riparian vegetation outside of the enclosure was dominated by shrub/scrub (sagebrush and chokecherry) with little herbaceous vegetation in evidence due to livestock presence.

Habitat surveys conducted by BLM (1995) on lower Dixie Creek show development of improved stream and riparian habitat conditions along about a 5-mile reach below its confluence with drainages from the Project Area in response to changes in livestock management initiated in 1990. Stream banks within this area are stable and well vegetated and exhibit willows and herbaceous riparian species. The floodplain in this area has become saturated and is effective at capturing sediment and dissipating flow energies while extensive wet meadow/ beaver dam complexes provide excellent habitat conditions for wildlife. Conditions are poor on the mostly intermittent 2-mile stretch of lower Dixie Creek below the restoration area and immediately upstream of the confluence with South Fork Humboldt River.

Habitat surveys conducted by BLM (1999, 2001) on South Fork Humboldt River show stream and riparian habitat conditions have improved over earlier surveys due to recent changes in grazing management. Riparian vegetation is becoming established on point bars and stream banks are stabilizing. However, because the South Fork Humboldt River Management Plan was only recently initiated, problems including high width to depth ratios, a heavy sediment load, warm stream temperatures, and an absence of pool habitat are still prevalent.

WILDLIFE RESOURCES

The Study Area for wildlife resources includes the area within the proposed mine permit boundary and areas outside this boundary that are within the Dixie Creek watershed (**Figure 3-5**).

MAMMALS

BLM's list of mammals recorded in the Elko District totals 76 species, including five shrews, 12 bats, five rabbits and hares, 33 rodents, 15 carnivores, and six ungulates. Of this total, 60 species could be expected in the Study Area.

Wildlife species occupying the Study Area are typically associated with sagebrush and grassland communities and juniper woodlands, often in relatively steep terrain. Springs, seeps, and riparian areas provide important foraging and breeding habitat for aquatic as well as wide-ranging upland species. Large mammals that inhabit the Study Area include mule deer, pronghorn antelope, coyote, mountain lion, bobcat, and badger. Common small mammals include black-tailed jackrabbit, Townsend's ground squirrel, deer mice, kangaroo rat, northern pocket gopher, bushy-tailed woodrat, and least chipmunk (Cedar Creek Associates 1997).

The Study Area is year-around habitat for mule deer, which are present at low densities, most often in sagebrush and juniper habitats. During fall and winter, mule deer also migrate through the Study Area from the north and west; however, no critical deer habitat has been documented by NDOW in the Study Area.

The Study Area provides habitat for pronghorn antelope, which are present year-around. Sagebrush habitats are critical browse sources for pronghorns in winter; however, the steepness of terrain limits use by pronghorns in portions of the Study Area.

Species diversity of bats in the Study Area is high, with seven species documented to be present. Bats forage over upland and riparian habitats and roost in trees and rock crevices (see *Special-Status Wildlife Species* section in this chapter).

BIRDS

Birds in the Study Area include game species (i.e., sage grouse, chukar, and mourning doves), raptors (golden eagle, turkey vulture, red-tailed hawk, prairie falcon, Swainson's hawk, northern harrier, kestrel, great horned owl, and long-eared owl), and numerous passerine birds associated with grassland, sagebrush, and riparian habitats. Habitat in the Study Area is used by raptors for foraging; however, no raptor nesting territories have been documented (Westech 2004c). Although not reported for the Study Area, Herron *et al.* (1985) indicate that the Study Area is part of a larger area near Carlin, supporting relatively high nesting densities of barn owls and prairie falcons.

The chukar is an introduced game bird that occupies steep terrain near perennial seeps and springs. Mourning doves nest in tall shrubs and trees, often in association with intermittent drainages.

Common birds in the Study Area include western kingbird, Say's phoebe, horned lark, lark sparrow, western meadowlark, sage sparrow, and sage thrasher. Additional species that may also be present in the Study Area are based on a breeding bird survey conducted along Dixie Creek (Bradley 2004).

MIGRATORY BIRDS

An Executive Order signed on January 10, 2001, titled "Responsibilities of Federal Agencies to Protect Migratory Birds", directs executive departments and agencies to take actions to further implement the Migratory Bird Treaty Act. Section 3 of the Executive Order states that, "Each Federal agency taking actions that have, or are likely to have a measurable negative effect on migratory bird populations is directed to implement, within two years, a Memorandum of Understanding (MOU) with Fish and Wildlife Service that shall promote the conservation of migratory bird populations" and each agency shall "ensure that the environmental analysis of federal actions required by NEPA or other established environmental review processes evaluate effects of actions and agency plans on migratory birds, with emphasis on species of concern". Migratory birds in the Study Area that nest and forage in sagebrush-grassland and juniper woodland habitats include the species listed in the previous section.

AMPHIBIANS AND REPTILES

Amphibians and reptiles observed in the Study Area include Pacific tree frog, western fence lizard, and western rattlesnake (Maxim 2004b). Pacific tree frogs were present in the wetlands and drainages originating from Emigrant Springs. Based on distribution maps (Stebbins 1985), the following species also could be present in the Study Area: northern desert horned lizard, western terrestrial garter snake, Great Basin collared lizard, Great Basin whiptail, long-nosed leopard lizard, Nevada side-blotched lizard, northern desert horned lizard, Basin spadefoot, western toad, northern leopard frog, sagebrush lizard, western skink, western whiptail, rubber boa, striped whipsnake, western yellow-bellied racer, gopher snake, long-nosed snake, ground snake, and night snake.

SPECIAL STATUS WILDLIFE SPECIES

Special Status species include wildlife listed as threatened, endangered, or candidate species under the Endangered Species Act of 1973 and BLM sensitive species. Based on communication with the USFWS and Nevada Natural Heritage Program, a list of the federally-listed and state-sensitive species in the Study Area was obtained by BLM.

Federally-listed and BLM sensitive species known or with potential to occur on or near the Emigrant Project Study Area, or having suitable habitat present, are listed in **Table 3-**

20. Only species with habitat within or near the Study Area or where direct or indirect effects from the proposed project are likely to occur are addressed in this EIS. Species for which habitat is not present, or for which the Study Area is outside of their known range of occurrence, are listed in **Table 3-20** but are not addressed in detail in this EIS.

THREATENED AND ENDANGERED SPECIES

BALD EAGLE (Threatened)

The bald eagle listed under the Endangered Species Act has not been documented in the Study Area and suitable nesting habitat is not present. Bald eagles usually winter near unfrozen bodies of water because fish and waterfowl are common prey and riparian areas often have cottonwood trees used as perches. They are also known to roost in juniper trees (Bradley 2005), and move to upland sites to forage for small mammals or to feed on carrion.

LAHONTAN CUTTHROAT TROUT (Threatened)

The Lahontan cutthroat trout is an inland subspecies of cutthroat trout endemic to the physiographic Lahontan basin of northern Nevada, eastern California, and southern Oregon and was listed by the USFWS as endangered in 1970 (Federal Register Vol. 35, p. 13520). This species was subsequently reclassified as threatened in 1975 to facilitate management and allow regulated angling (Federal Register, Vol. 40, p. 29864). There is no designated critical habitat. The species has been introduced into habitats outside its native range, primarily for recreational fishing purposes (USFWS 1995).

Based on geographic, ecological, behavioral, and genetic factors, the USFWS determined that three distinct vertebrate population segments of Lahontan cutthroat trout exist and include the Western Lahontan basin, Northwestern Lahontan basin, and the Humboldt River Basin. Genetic and morphometric differentiation of Lahontan cutthroat trout native to the Humboldt River basin warrants formal recognition and classification as a unique subspecies of cutthroat trout (USFWS 1995).

Historically, Lahontan cutthroat trout occupied steams throughout the Humboldt River watershed. Habitat degradation, water development projects, and introduction of non-native trout have eliminated this species over much of its historic range. Stream surveys within the South Fork Humboldt River drainages have identified 20 streams with approximately 57.7 miles of occupied habitat (USFWS 1995).

Upper Dixie Creek supports a small population of Lahontan cutthroat trout with an average of approximately 79 fish per mile (BLM 1998). The existing population of Lahontan cutthroat trout is located approximately 15 miles upstream of the confluence of Dixie Creek and the unnamed tributary within the proposed Project Area. The upper reaches of Dixie Creek provide better habitat than the lower reaches with the exception of about five miles of restored habitat located on public lands just below the confluence of the Emigrant drainages, which currently are not occupied by Lahontan cutthroat trout. Since 1990, the BLM has worked with local livestock interests to restore the aforementioned five miles of Dixie Creek on public lands. The upper reaches are improving in response to management actions initiated through the Agreement for Management of the El Jiggs (Dixie Creek) Allotment issued in 1998. BLM is improving habitat to potentially sustain populations of Lahontan cutthroat trout throughout the creek, not just the headwaters.

TABLE 3-20
Special Status Species With Potential to Occur In or Near Emigrant Project Study Area

Species	Status	Habitat
Species Documented in the Study Area		
Sage grouse (*Centrocercus urophasianus*)	BLM sensitive; Present in the mine permit area.	Sage brush habitat and wet meadows and riparian areas for brood rearing
White-faced ibis (*Plegadis chihi*)	BLM sensitive; nesting and foraging habitat present along Dixie Creek.	Wetlands and riparian areas with emergent vegetation
Pallid bat (*Antrozous pallidus*)	BLM sensitive; present in the mine permit area.	Roosts in caves, mineshafts, buildings, under bridges and in trees; forages in woodlands over water and desert washes.
Big brown bat (*Eptesicus fuscus*)	BLM sensitive; present in the mine permit area.	Roosts in caves, mineshafts, trees, buildings, under bridges; forages over water and in woodlands.
Western red bat (*Lasiurus blossevillii*)	BLM sensitive; present in the mine permit area.	Roosts in trees; forages over water and in woodlands
Hoary bat (*Lasiurus cinereus*)	BLM sensitive; present in the mine permit area.	Roosts in trees, cliffs, mines, caves, and talus; forages over water and in woodlands.
Western small-footed myotis (*Myotis ciliolabrum*)	BLM sensitive; present in the mine permit area.	Forages along cliffs, rocky slopes and sometimes over water. Roosts/breeds in rock crevices, talus, caves, mine adits, abandoned buildings,
Western long-eared myotis (*Myotis evotis*)	BLM sensitive; present in the mine permit area.	Roosts in trees, caves, crevices, buildings, and under bridges; forages over water and in woodlands.
Long-legged myotis (*Myotis volans*)	BLM sensitive; present in the mine permit area.	Conifer forests and piñon-juniper woodlands. Roosts under loose tree bark, in buildings, caves, rock crevices and mines
California floater (*Anodonta californiensis*)	BLM sensitive; present in South Fork Humboldt River; shells found in Dixie Creek, but live specimens not documented.	Rivers with fish including South Fork Humboldt River and possibly Dixie Creek.
Lahontan cutthroat trout (*Orthorynchus clarki henshawi*)	Threatened; native population present in upper Dixie Creek, hatchery stock present in South Fork Humboldt River.	Cool relatively pristine streams and lakes
Species Not Documented in Study Area but Potentially Present Because of Suitable Habitat and Range of Occurrence		
Bald eagle (*Haliaeetus leucocephalus*)	Threatened may occasionally be present in Study Area during winter.	Periodic seasonal migrant in winter, present near open water where favored prey (waterfowl and fish) are present or where carrion is available
Northern goshawk (*Accipiter gentilis*)	BLM sensitive, not known to nest in Study Area; suitable nesting habitat is present.	Nests in aspen stands, usually near streams
Ferruginous hawk (*Buteo regalis*)	BLM sensitive, not known to nest in Study Area; suitable nesting habitat is present.	Prefers to nest at interface of piñon -juniper zone and desert shrub communities
Swainson's hawk (*Buteo swainsoni*)	BLM sensitive, not known to nest in Study Area.	Nests in deciduous trees and shrubs in riparian areas or around springs
Burrowing owl (*Athene cunicularia hypugaea*)	BLM sensitive, not known to nest in Study Area, but habitat is present	Nests in grasslands and shrublands, often in association with ground squirrels and badgers, which excavate burrows it uses for nesting
Yuma myotis (*Myotis yumanensis*)	BLM sensitive, not documented in Study Area, but suitable foraging habitat may be present	Forages in riparian areas near forest edges, roosts and breeds in buildings, caves, mines, and under bridges
Spotted bat (*Euderma maculatum*)	BLM sensitive, not documented but suitable habitat present at Emigrant Spring and un-named drainages	Low deserts to montane forests with rock outcrops and cliffs. Forages over water and among trees
Preble's shrew (*Sorex preblei*)	BLM sensitive, not documented in Study Area, but suitable habitat is present in Elko County	Sagebrush, grassland, riparian habitats and marshy areas
Pygmy rabbit (*Brachylagus idahoensis*)	BLM sensitive, uncertain if present in Study Area, but suitable habitat is present and it has been found locally.	Relatively tall, dense big sagebrush communities with deep soils suitable for establishing burrows
Little brown myotis (*Myotis lucifugus*)	BLM sensitive, not documented in Study Area, caves, mines, and buildings not present.	Prefers to forage over water. Usually hibernates in caves and mines, often roosts and breeds in buildings.

TABLE 3-20 (continued)
Special Status Species With Potential to Occur In or Near Emigrant Project Study Area

Species	Status	Habitat
Western pipistrelle (*Pipistrellus hesperus*)	BLM sensitive.	Roosts in trees, caves, buildings, and under bridges; forages over water, desert washes, and in woodlands.
Silver-haired bat (*Lasionycteris noctivagans*)	BLM sensitive.	Roosts in trees, caves, mines, buildings, and under bridges; forages over water and in woodlands.
Brazilian free-tailed bat (*Tadarida braziliensis*)	BLM sensitive.	Roosts in trees, caves, buildings, and under bridges; forages over water and desert washes and in woodlands.
Fringed myotis (*Myotis thysanodes*)	BLM sensitive; documented in Elko County.	Breeds and roosts in mines, buildings, rock crevices, caves, and under tree bark; forages in desert scrub and juniper woodlands.
Townsend's big-eared bat (*Corynorhinus townsendii*)	BLM sensitive, not documented in Study Area. foraging habitat; unlikely to be present.	Roosts and breeds mines, caves, and under bridges; returns yearly to same roost sites.
Nevada viceroy (*Limenitis archippus lahontani*)	BLM sensitive, suitable willow habitat is lacking in the Study Area but is present along Dixie Creek and South Fork Humboldt River.	Riparian habitats in association with willow and cottonwoods, host plants for larvae of this species.
Habitat not Present in Study Area; and/or Species Unlikely to Occur Because of Range of Occurrence		
Mountain quail (*Oreortyx pictus*)	BLM sensitive; dense vegetation, preferred habitat not present in Study Area.	Conifer forest, chapparal, and piñon-juniper communities with dense vegetation
Black tern (*Chlidonias niger*)	BLM sensitive, habitat not present in Study Area	Freshwater marshes and sloughs
Western yellow-billed cuckoo (*Coccyzus americanus occidentalis*)	Candidate for federal listing, habitat not present in Study Area	Riparian woodlands with dense thickets of shrubs and trees
Peregrine falcon (*Falco peregrinus*)	BLM sensitive, not documented in Study Area, suitable nesting habitat not present	Open habitats near cliffs and mountains with an adequate prey base usually near water
Western least bittern (Ixobrychus exilis hesperis)	BLM sensitive; nesting and foraging habitat not present in Study Area.	Wetlands and riparian areas with emergent vegetation
Flammulated owl (*Otus flammeolus*)	BLM sensitive, nesting and foraging habitat not present in Study Area	Mountain pine forests
Western snowy plover (*Charadrius alexandrinus nivosus*)	BLM sensitive, habitat not present in Study Area	Shorelines of alkaline lakes and playas
California myotis (*Myotis californicus*)	BLM sensitive; documented in Elko County.	Roosts in caves, crevices, talus, trees, buildings, and under bridges; forages over water and in desert washes and woodlands.
Spotted frog (*Rana lutiventris*)	Candidate for federal listing; not known to occur in the Study Area.	Ponds, wetlands, seeps, and springs
River otter (*Lutra canadensis*)	BLM sensitive, suitable habitat not present in Study Area.	Rivers and streams
Transverse gland springsnail (*Pyrgulopsis cruciglans*)	BLM sensitive, not documented in Study Area during baseline studies.	Springs with aquatic vegetation
Humboldt springsnail (*Pyrgulopsis humboldtensis*)	BLM sensitive, not documented in Study Area during baseline studies.	Springs with aquatic vegetation
Vinyards springsnail (*Pyrgulopsis vinyardi*)	BLM sensitive, not documented in Study Area during baseline studies	Springs with aquatic vegetation
Mattoni's blue butterfly (*Euphilotes pallescens mattonii*)	BLM sensitive. Habitat may not be present in Study Area because obligate host plant not present	Piñon-juniper zone downslope to shrublands and grasslands. Larvae dependent on the plant *Eriogonum microthecum laxiflorum*, occurring on rocky ridges
Grey's silverspot butterfly (*Speyeria hesperis greyi*)	BLM sensitive. Habitat not present in Study Area	Cool forest near streams and wet meadows at elevation 8,500-10,000 feet

Source: Harvey *et al.* 1999; Erhlich *et al.* 1988; Sibley 2001; Herron *et al.* 1985; Nevada Natural Heritage Program 2004a; Cedar Creek Associates 1997; Nevada Bat Working Group 2002; Lamp 2004.

Much of the remaining habitat on lower Dixie Creek is located on private land and is limited by impacts from grazing, degraded physical habitat, and flow. Although occasional cutthroat trout (hatchery sources not targeted for recovery in the 1995 Lahontan Cutthroat Trout Recovery Plan), have been documented downstream from the South Fork Humboldt River dam (Elliot 2004), Dixie Creek could be accessed by nonnative salmonids including brown and rainbow trout from South Fork Humboldt River. However, there is no evidence of recent spawning by trout in the lower reaches of Dixie Creek (SWCA 2004).

SENSITIVE SPECIES

BATS

Most bat species listed in **Table 3-20** have potential to use habitat in the Study Area for foraging, roosting, and breeding. Seven bat species were documented in the Study Area during an August 2004 survey (Butts 2004). Wetlands and surface water associated with springs and seeps, sagebrush grasslands, juniper woodlands, and rocky outcrops may provide habitat for some or all bat species listed as sensitive in **Table 3-20.** Rock crevices may provide roosting habitat and marginal breeding habitat. Caves, mines, and abandoned buildings optimum for roosting and breeding for colonies of bats have not been documented in the Study Area.

Three species, Western small-footed myotis, Long-legged myotis, and Western long-eared myotis, were captured in mist nets. These species were also most common, based upon acoustic recordings. Four species, big brown bat, pallid bat, hoary bat, and western red bat, were documented acoustically. A number of other bat species may occur in the Study Area but were not documented. These species include little brown, Yuma myotis, fringed myotis, spotted, western pipistrelle, Townsend's big-eared, Brazilian free-tailed, and silver-haired bats.

Water sources are critical to bats because they drink from open water and insects are more abundant around wetlands and open water. Studies in desert habitats have found that bat activity is 40 times greater near wetlands and riparian areas than in upland areas (Nevada Bat Working Group 2002). Even high-elevation tree roosting bats fly to open water, wetlands, and riparian areas to drink and forage.

Species of bats with potential to occupy habitat in the Study Area vary in the degree to which their populations and habitats are at risk. According to the Nevada Bat Working Group (2002), species at high risk are the fringed myotis, western red bat, and Townsend's big-eared bat (**Table 3-21**).

PREBLE'S SHREW

The ecology, life history, and habitat characteristics of Preble's shrew are poorly known (Foresman 2001; Clark and Stromberg 1987); however, over its range it has been found mostly in sagebrush and grassland habitats and occasionally in coniferous forest, marshes, and riparian areas. Suitable habitat appears to be present in the Study Area and the species has been documented to be present in Elko County (Nevada Natural Heritage Program 2004b).

PYGMY RABBIT

Pygmy rabbits prefer areas of relatively tall, dense sagebrush with deep soil suitable for excavating burrows. Sagebrush is the primary food of pygmy rabbits, but they also eat grasses and forbs depending on the seasonal availability. In Nevada, pygmy rabbits are generally found in sagebrush-dominated broad valley floors, stream banks, alluvial fans, and other areas with friable soil. Searches of the Study Area for pygmy rabbits, did not visually document the

TABLE 3-21
Conservation Status of Bats Potentially Present in Study Area
Emigrant Project

Species	Populations/Habitats at Risk[1]
Pallid bat	Moderate
Big brown bat	Low
Western red bat	High
Hoary bat	Moderate
Small-footed myotis	Moderate
Long-eared myotis	Moderate
Long-legged myotis	Low
Silver-haired bat	Moderate
Little brown bat	Moderate
Western pipistrelle	Moderate
Brazilian free-tailed bat	Low
Yuma myotis	Moderate
Fringed myotis	High
Townsend's big-eared bat	High

Source: Nevada Bat Working Group 2002.

presence of pygmy rabbits; however, burrows, and fecal deposits which could be evidence of pygmy rabbits were observed (Westech 2004c). Small fecal pellets, typical of pygmy rabbits, were observed mixed with larger pellets from cottontail rabbits. Numerous cottontail rabbits were observed, including immature. Small fecal pellets from immature cottontail rabbits cannot be reliably discriminated visually from pygmy rabbit pellets.

SAGE GROUSE

Sage grouse forage, nest, and winter in the Study Area; however, there are no known traditional breeding grounds ("leks"). The closest lek is west of the Rain Mine, several miles from the Study Area, and four other leks are within six miles of the proposed Study Area. Sage grouse are obligately linked to sagebrush, which is their primary food in fall and winter. In spring and summer, sage grouse also feed on herbaceous vegetation and insects. Wetland and riparian areas are important brood-rearing areas for sage grouse. Female sage grouse with broods were observed in 1995 and 2004 at Emigrant Springs (Westech 2004c). Fires over the past few years have reduced the spatial extent and quality of large acreages of sagebrush habitat locally and regionally.

SWAINSON'S HAWK

Swainson's hawks are seasonal residents and nesters in the Study Area, migrating to South and Central America in winter (Ryser 1985). This hawk nests in clumps of trees, often in agricultural and riparian areas or near springs. Swainson's hawks feed mostly on large insects and small mammals; however, they will also take bats, birds, and amphibians. This hawk may forage in the Study Area, but is not known to nest in the Study Area.

BURROWING OWL

Burrowing owls nest in underground burrows excavated by ground squirrels, badgers, and other mammals, but are also able to excavate their own burrows. They usually occupy sagebrush and grassland habitats and often use the same nesting burrow for a number of years. Although burrowing owls can often be seen

perched on or near their burrow during the day, they forage at night for nocturnal small mammals, spadefoot toads, and insects. Burrowing owls usually migrate south from Nevada in winter, but there are records of them over wintering in their burrows in a state of torpor (Ryser 1985). Burrowing owls have not been observed in the Project Area but have been identified near Tonka Creek (Spence 2004).

FERRUGINOUS HAWK

Ferruginous hawks nest in scattered juniper trees at the interface of the piñyon-juniper zone and desert shrub communities overlooking broad open valleys (Herron *et al.* 1985). The ferruginous hawk preys mostly on rodents and rabbits but will also take birds and reptiles. Ferruginous hawks may forage in the Study Area, but there are no known nests (Lamp 2004; Westech 2004c).

CALIFORNIA FLOATER

The California floater is a freshwater mussel that lives in shallow areas of lakes, ponds, and rivers. They burrow into soft, silty substrates and feed on bacteria, plankton, and detritus, which it strains from the water with its gills. The life cycle of this mussel includes a parasitic larval stage, during which it is dependent on upon host fish, usually native minnows. The decline of native fish host species has been attributed to declines in native fish, increases in sedimentation, predation by introduced fishes, and effects of dams. Live California floaters are present in South Fork Humboldt River, while shells have been found in Dixie Creek (Evans 2004).

WHITE-FACED IBIS

The white-faced ibis is a wading bird of freshwater marshes, ponds, and rivers, where it feeds on insects, aquatic invertebrates, amphibians, and fish. During the nesting season, they are colonial, constructing nests among aquatic plants or floating mats of vegetation. The white-faced ibis has been documented in wetlands along Dixie Creek (Bradley 2004).

NEVADA VICEROY

This butterfly inhabits moist open or shrubby areas such as riparian wetlands, willow thickets, and wet meadows. Host plants for the caterpillar of the Nevada viceroy are trees and shrubs such as willow and cottonwood. Early in the season when few flowers are available, viceroys feed on aphid honeydew, carrion, dung, and decaying fungi. Later in the season they feed on nectar from flowers, favoring species of the sunflower family. Habitat for this species is present along Dixie Creek and South Fork Humboldt River.

RECREATION

The Study Area for Recreation is shown on **Figure 3-10** and consists of the BLM Elko District (which includes all of Elko County and northern portions of Eureka and Lander counties). The Elko District extends over 12 million acres, about one-sixth of Nevada's total area. BLM administers 7.5 million acres of public land in the District that consists primarily of high desert and mountainous areas.

Outdoor recreational areas and facilities in the Study Area include those managed by BLM, Nevada Division of Forestry, Nevada Division of State Parks, U. S. Forest Service (USFS), United States Fish and Wildlife Service (USFWS), Bureau of Indian Affairs (BIA), and private operators (**Figure 3-10**). Public land within these areas provide diverse recreational activities, including fishing, sightseeing, hunting, cross-country skiing, horseback riding, white water rafting, photography, rockhounding, and off-highway vehicle use (BLM 2004b).

BLM has designated six Special Recreation Management Areas (SRMAs) managed by the

Elko Field Office. SRMAs are areas warranting intensified management. The nearest SRMA to the proposed Emigrant Project is South Fork Canyon, located approximately 12 miles east of the Project Area. South Fork Canyon encompasses 3,360 acres and has no developed facilities. The Zunino/Jiggs Reservoir SRMA is approximately 20 miles southeast of the Project Area and has a restroom, picnic tables, barbecues, and campground. The Wilson Reservoir SRMA is located 85 miles north of the proposed Project Area. Facilities include a boat ramp, restrooms, campground, and drinking water source. Wild Horse SRMA, approximately 85 miles northeast of the Project Area, has a BLM campground. Campgrounds and boat ramps are also located on BIA-administered land at Wild Horse State Recreation Area at Wild Horse Reservoir. The South Fork Owyhee River SRMA is located 90 miles north of the Project Area and contains a narrow corridor along the river, which is eligible for Wild and Scenic River designation. Salmon Falls Creek SRMA is over 100 miles from the Project Area near the town of Jackpot, Nevada.

The BLM Back Country Byways Program identifies historical and scenic routes on public land. The Byways Program is designed to encourage use of existing back roads through greater public awareness. In the northeast corner of the Elko District, the California Trail Back Country Byway provides over 80 miles of scenic travel paralleling the original California Trail. The trail was a major route used by pioneers traveling from the Midwest to California and Oregon. The Carlin Canyon Historical Wayside includes interpretative signs describing the geology and history of the area, parking spaces, and benches.

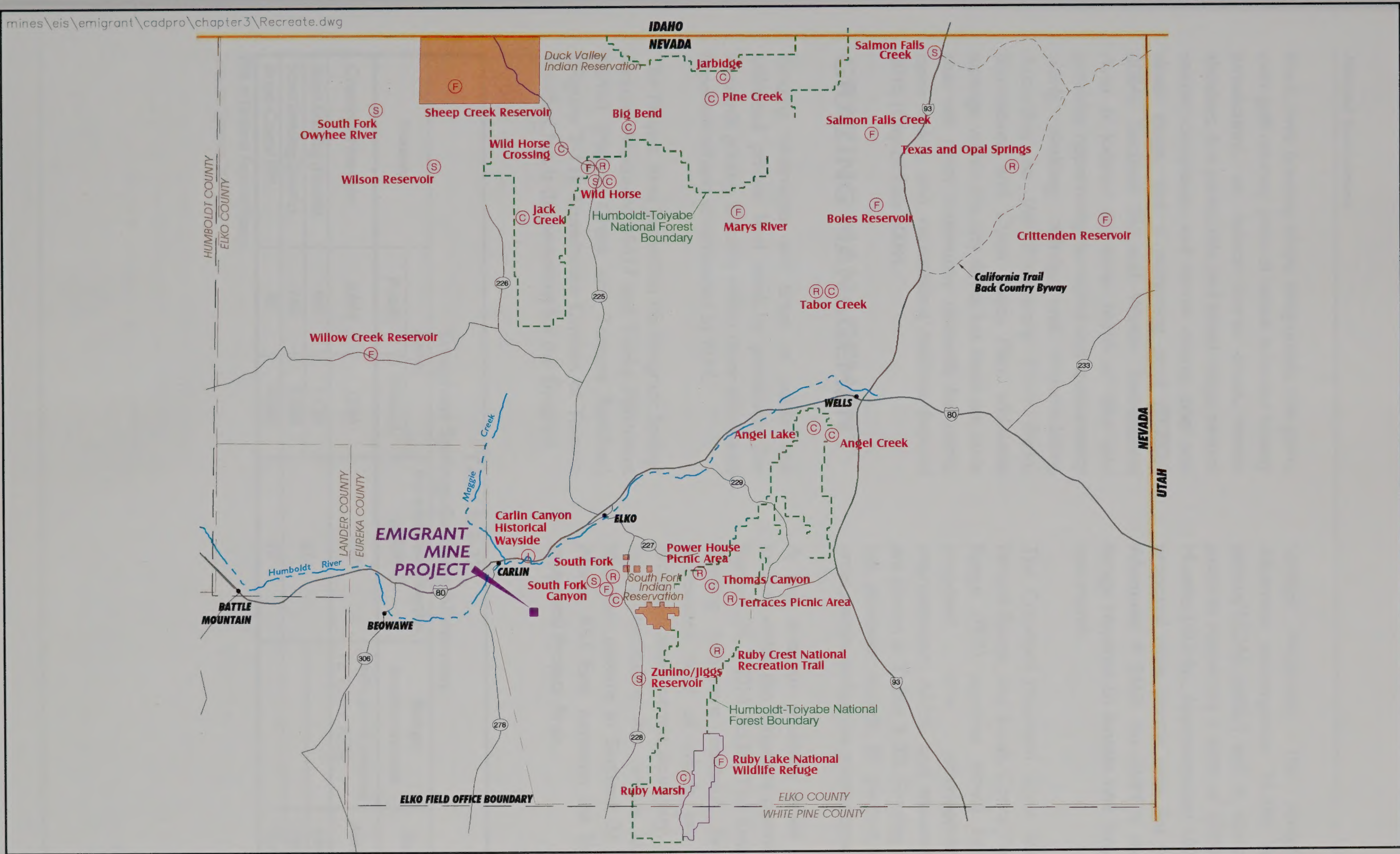
The USFS has three ranger districts in Elko County: Ruby Mountains, Mountain City, and Jarbidge. Of the three districts in Elko County, Ruby Mountains Ranger District experiences the heaviest recreation use. Located within 20 miles of Elko and Interstate 80, the Ruby Mountains Ranger District has 121 campsites in four campgrounds, two picnic areas, and two wilderness areas. The Lamoille Canyon Scenic Byway provides 12 miles of paved access in the Ruby Mountains with three pullouts and interpretive signs. At the end of the scenic byway, a trailhead provides access to the 40-mile-long Ruby Crest National Recreation Trail (USDA/HTNF 2004).

The Mountain City Ranger District has three campgrounds. The Jarbidge Ranger District has two campgrounds and one wilderness area. Both districts experience heavy use on weekends (USDA/HTNF 2004).

Willow Creek Reservoir is located in Elko County approximately 50 miles northwest of the proposed Project Area. Willow Creek Reservoir is owned by Barrick Goldstrike Mining Company but is open to the public. NDOW manages the reservoir as a warm water fishery and periodically stocks it with crappie and channel catfish. The reservoir is also known to contain Lahontan cutthroat trout. Camping is allowed at the reservoir; however there are no developed facilities (Lamp 2004).

The South Fork State Recreation Area (SRA) is located 15 miles east of the proposed Project Area adjacent to BLM's South Fork Canyon SRMA. Facilities at the South Fork Reservoir SRA include a boat ramp, campground, and administrative facility. The Wild Horse SRA is located approximately 85 miles northeast of the Project Area. The Wild Horse SRA encompasses 80 acres situated on the northeast shore of the Wild Horse Reservoir just off Nevada Highway 225. Amenities at the Wild Horse SRA include a campground and restrooms.

The communities of Carlin and Elko (including Spring Creek) have a number of recreational facilities. Carlin has an archery range, three baseball fields, a park and playground area, a moto-cross track, a tennis court, and a volleyball court. Elko has numerous baseball fields, a BMX



Sources: 1. Bureau of Land Management 2004
2. Humboldt-Toiyabe National Forest 2004
3. Nevada Division of State Parks 1992

N

0 Miles 20

Ⓘ Interpretive Site
Ⓒ Campground
Ⓕ Fishing Area
Ⓡ Recreation Area
Ⓢ Special Recreation Management Area

Recreation Areas
Emigrant Mine Project
Elko County, Nevada
FIGURE 3-10

track, two bowling alleys, fairgrounds, five gyms, two golf courses (one of which is under county jurisdiction), an indoor horse arena, movie theaters, five parks, rifle and pistol range, several soccer complexes and tennis courts, trap and skeet range, and a swimming pool (ECEDA 2004). Snobowl Ski and Winter Recreational Area is located six miles north of Elko and provides opportunity for alpine and cross-county skiing, sledding, tubing, and snowmobiling. According to the Preliminary Draft Parks, Recreation, and Open Space Plan, additional acreage within the city limits has been set aside that will meet community demands for parks, open space, and recreational facilities beyond 2010 (City of Elko 2004).

GRAZING MANAGEMENT

Grazing allotments are areas of public and unfenced private land used by permittees for livestock grazing. Grazing within these allotments is permitted and administered by BLM.

The Project Area lies within the Emigrant Springs Grazing Allotment #5417 and Tonka Allotment #5468 (Maggie Creek and Tomera Ranches) (**Figure 3-11**). Stonehouse Division of Tomera Ranches, Inc. is the permittee for the Emigrant Springs Allotment. The Emigrant Springs Allotment encompasses 26,766 acres (13,520 private/13,246 public) and is comprised of six pastures supporting a total of 1,286 Animal Unit Months (AUMs). Approximately 100 acres of the proposed mine permit area lies within Tonka Allotment # 5468. An AUM is the amount of forage required to sustain one cow and calf for one month.

The Crawford Mountain, Scott Seeding Federal Fenced Range, and Brush Corral Federal Fenced Range (FFR) pastures would be affected by proposed mine development. Range improvements, AUMs, and seasonal restrictions, are shown in **Table 3-22**. Grazing restrictions in the allotment include 50 percent utilization on grass species during the grazing season.

A key area to measure grass utilization is located within the proposed permit boundary in Section 35, T32N, R53E. The Emigrant Springs Grazing Allotment contains five vegetation enclosures, four of which are outside the proposed mine permit boundary. The Emigrant Spring enclosure lies within the Crawford Mountain pasture in Sections 34 and 35, T32 North, R53 East, between the Rain Mine and proposed Project Area.

TABLE 3-22
Emigrant Springs Grazing Allotment

Pasture	Acres		Animal Unit Months (AUMs)	Range Improvements	Season of Use
	Public	Private			
Crawford Mountain	5,046	1,034	537	Cattle guard, Section 12, T31N, R53E	April 15 – Nov. 30
Scott Seeding (North)	480	1,120	67		April 1 – Nov. 30
Scott Seeding (South)	240	1,760			April 1 – Nov. 30
Brush Corral FFR	80	4,320	13		April 1 – Nov. 30

FFR = Federal Fenced Range
Source: Spence 2004.

ACCESS AND LAND USE

The primary Study Area for access and land use is the Project Area (**Figure 3-11**).

ACCESS

The proposed Emigrant Project is located approximately ten miles southeast of Carlin and is accessed via the Rain Mine road from Highway 278 south of Carlin. The Tonka Creek road, which passes through the area extends from the Newmont Rain road through the proposed mine area into Dixie Creek and provides continuous or "loop" travel through the area (**Figure 2-2**). Numerous two-track roads provide access throughout the area to support livestock grazing operations and public access for recreational purposes.

BLM has issued two rights-of-way to Newmont in the Project Area. Right-of-way N-47282 was issued for a water well, water pipeline, overhead powerline, and access road. Two water supply production wells (RPW-1 and RPW-2) were installed by Newmont during 1988 along Dixie Creek to provide water for the Rain Mine. Water from these production wells is transported six miles to the Rain Mine by a 12-inch diameter buried pipeline located within the right-of-way. Right-of-way N-47290 was issued for a communication site and access road.

LAND USE

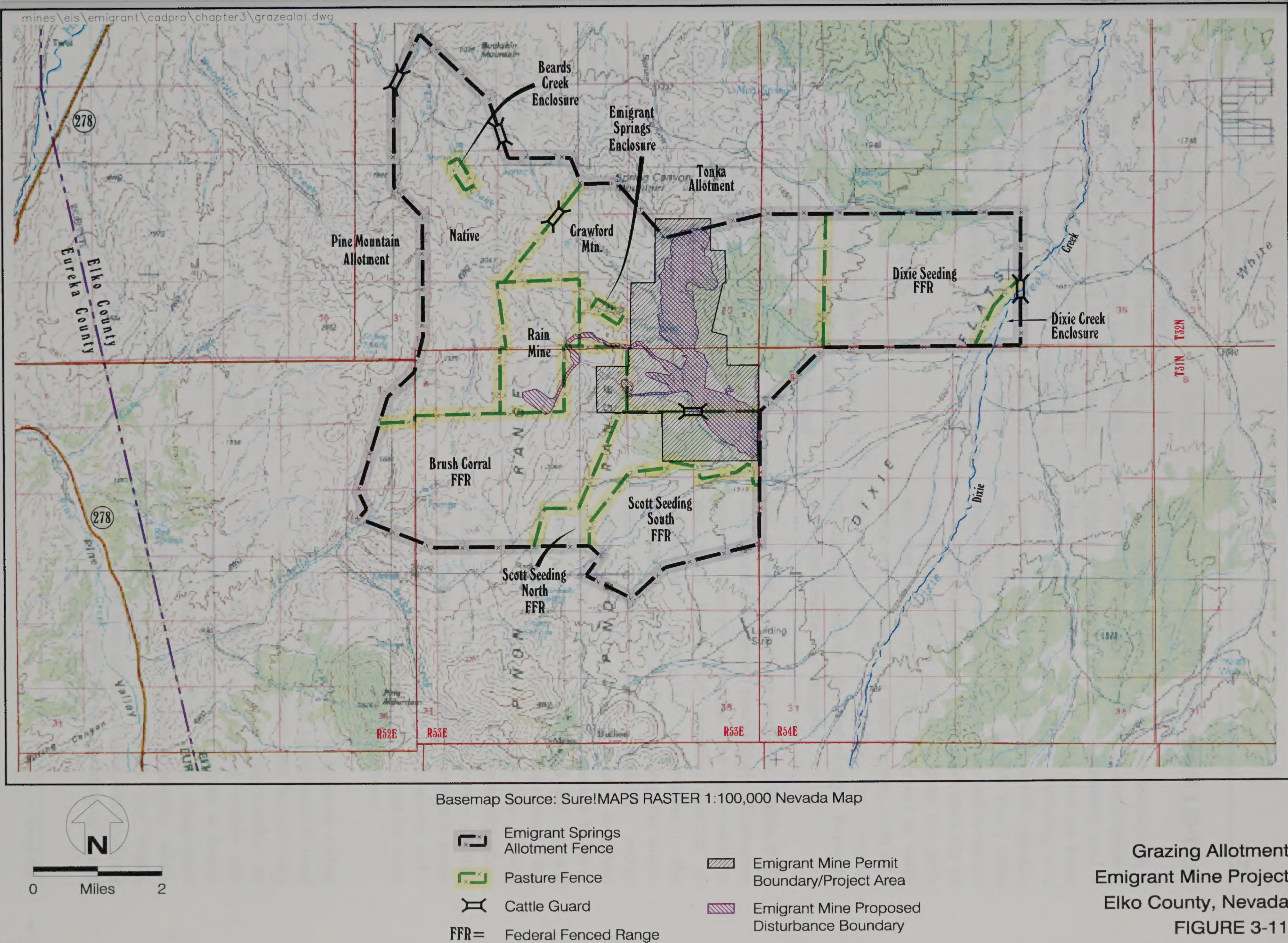
Dominant land uses in the Project Area include mining, livestock grazing, and outdoor recreation. Although mining has occurred in the area throughout the last century, major mine development in the southern portion of the Carlin Trend has occurred since 1987.

NOISE

Noise is generally defined as unwanted sound, and can be intermittent or continuous, steady or impulsive, stationary or transient. Noise levels heard by humans and animals are dependent on several variables, including distance between the source and receiver, altitude, temperature, humidity, wind speed, terrain, and vegetation. Human and animal perception of noise is affected by intensity, frequency, pitch and duration, as well as the auditory system and physiology of the animal. Noise can influence humans or wildlife by interfering with normal activities or diminishing the quality of the environment.

Noise levels are quantified using units of decibels (dB). Decibels are logarithmic values, and cannot be combined using normal algebraic addition. Humans typically have reduced hearing sensitivity at low frequencies compared with their response at high frequencies, and the "A-weighting" of noise levels, or A-weighted decibels (dBA), closely correlates to the frequency response of normal human hearing. Although A-weighting is unlikely appropriate for all animals since it was developed specifically for the human ear, it is commonly used to quantify most types of sounds at all levels including evaluating effects on wildlife, because it is convenient to use and is used extensively, but much is still unknown about the hearing mechanisms of animals (Bommer and Bruce 1996; EPA 1979). In addition, C-weighted noise levels (dBC) are used to approximate the human perception of low frequency sound that is associated with high-intensity noises, such as blasting, sonic booms, and heavy artillery.

For environmental noise studies, noise levels are typically described using A-weighted equivalent noise levels, L_{eq}, during a certain time period. The L_{eq} metric is useful because it uses a single number to describe the constantly fluctuating instantaneous ambient noise levels at a receptor location during a period of time, and accounts for all of the noises and quiet periods that occur during that time period.



Grazing Allotment
Emigrant Mine Project
Elko County, Nevada
FIGURE 3-11

The day-night average noise level, L_{dn}, is a single number descriptor that represents the constantly varying sound level during a continuous 24-hour period. The L_{dn} is typically calculated using 24 consecutive 1-hour L_{eq} noise levels. The L_{dn} includes a 10 dBA penalty that is added to noises that occur during the nighttime hours between 10:00 p.m. and 7:00 a.m. to account for people's higher sensitivity to noise at night when the background noise level is typically low.

NOISE GUIDELINES

No state or county noise regulations exist to govern environmental noise levels or the noise that would be generated by the Proposed Action, however, federal noise guidelines apply. As a result of the Noise Control Act of 1972, the EPA developed acceptable noise levels under various conditions that would protect public health and welfare with an adequate margin of safety. The EPA identified outdoor L_{dn} noise levels less than or equal to 55 dBA are sufficient to protect public health and welfare in residential areas and other places where quiet is a basis for use (EPA 1979). Although the EPA guideline is not an enforceable regulation, it is a commonly accepted target noise level for environmental noise studies. In addition, the National Environmental Policy Act (1969) and the Endangered Species Act (1973) define noise-related disturbances on wildlife as "harassment", but no guidelines or regulations have been developed to quantify animal annoyance noise levels.

No regulations exist to limit the blasting noise produced by the Proposed Action, but the U.S. Army has determined an approximate level associated with human annoyance to blast noise. In general, a peak blast noise level of approximately 122 dBC represents the threshold of annoyance for people (Greene and Greene 1997).

EXISTING AMBIENT NOISE LEVELS

The ambient noise at a receptor location in a given environment is the all-encompassing sound associated with that environment, and is due to the combination of noise sources from many directions, near and far, including the noise source of interest. Noise levels typically decrease by approximately 6 dBA every time the distance between the source and receptor is doubled depending on the characteristics of the source and the conditions over the path that the noise travels. The reduction in noise levels are increased if a solid barrier, such as a man-made wall, a building, or natural topography, blocks the line-of-sight between the noise source and receptor.

For general comparison purposes, **Table 3-23** lists typical A-weighted sound levels of common noise sources and activities. The noise levels in the table listed for specific sources at referenced distances, represent the approximate maximum levels during that event. Such maximum levels typically occur instantaneously and are not sustained continuously over a prolonged period of time. Similarly, the noise levels listed for general sources or environments represent the approximate minimum levels for the general conditions listed. Minimum levels typically occur instantaneously between louder noises created by identifiable sources. A 6-dBA change in noise level is clearly perceptible to most people, and a 10-dBA change in noise level is judged by most people as a doubling of the sound level.

The Project Area is located in a gently rolling rural environment. Ambient noise levels in rural areas are typically considered low, but can vary widely. No residences, campgrounds, or recreation facilities are located within the Project Area. Noise sources within a 5-mile radius include the Rain Mine heap-leach processing and reclamation activities, wind-generated noise through grass and trees, flowing water near creeks, wildlife, aircraft flying overhead and taking off from a landing strip, and vehicles traveling on roads.

TABLE 3-23 Common Noise Levels, Sources, and Subjective Human Evaluation		
Noise Level (dBA)	**Noise Source**	**Subjective Human Evaluation**
120 110	• Jet take-off at 100 feet • Hard rock concert • Motorcycle accelerating a few feet away	Deafening
100 90	• Automobile horn 10 feet away • Gas lawnmower 3 feet away • Diesel truck driving by 50 feet away • Inside a computer equipment room	Very Loud
80 70	• Very loud speech - 3 feet away • Crackling plastic food wrapper 2 feet away • Car driving by at 55 mph 50 feet away • Outdoors in a commercial area	Loud
60 50	• Normal speech 3 feet away • Typical office activities • Background noise in a conference room	Moderate
40 30	• Library background noise • Quiet suburban environment at night • Typical background noise in a residence • Whisper 3 feet away • Typical broadcast studio	Faint
20 10	• Concert hall background noise • Human breathing	Very Faint
0	• Threshold of hearing or audibility	

Source: Egan 1988; Cavanaugh and Tocci 1998; Burge 2002.

Ambient background noise level measurements have not been conducted in the Project Area. Because the surrounding area is rural and not populated, the existing 1-hour L_{eq} ambient noise levels are assumed to be 40 dBA during the daytime (7 a.m. to 10 p.m.) and 35 dBA at night (10 p.m. to 7 a.m.), and the estimated existing L_{dn} is assumed to be 35 dBA throughout the Project Area based on noise level measurements in similar areas (EPA 1971). Although the ambient noise levels at specific locations near creeks or rivers, at the Rain Mine (located 2.5 miles west), or near roads may be higher, the estimated existing ambient levels are considered conservative but reasonable. Wildlife that live, forage, and pass through the Project Area are the primary noise-sensitive receptors.

VISUAL RESOURCES

The objectives of the visual resource investigation are to identify and describe important visual resources that could be affected by the proposed expansion and related facilities. The BLM has developed a Visual Resource Management System (VRM) to classify visual resources based on scenic quality, visual sensitivity, and visual distance zones. (**Table 3-24**) The Project Area has been given a VRM Class IV designation. This allows for major modification of the existing character of the landscape. These modifications may dominate the view but every attempt must be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements.

TABLE 3-24
Visual Resource Management Objectives

Class	Objective
I	The objective of this class is to preserve the existing character of the landscape. This class provides natural ecological changes, it does not preclude limited management activity. The level of change to the characteristic landscape should be low and must not attract attention.
II	The objective of this class is to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract attention of the casual observer. Any changes must repeat the basic elements of form, line, color and texture found in the predominant features of the characteristic landscape.
III	The objective of this class is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant features of the characteristic landscape.
IV	The objective of this class is to provide for management activities that require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. The impacts of these activities should be minimized through careful location, minimal disturbance and repetition of the basic elements.

Source: BLM 1986.

The Project is located on the eastern slopes of the Piñon Range in the Dixie Creek Basin. The visual resources of the area are steep mountains giving way to gentle slopes and rolling hills bisected by several drainages. Vegetation consists of sagebrush, rabbitbrush, single leaf piñon, and various grasses that color the hills in shades of green, gold, and brown. Grey, brown, and black indicate areas of sparse vegetation, soil, and rocks.

The Project Area is located in a steep canyon that is not easily visible from any major roadway or recreation area. The prominent view of the mine would be from the main access road, making the primary viewers mine employees and/or mine service contractors. Occasional four-wheel drive recreationists and hunters may also catch a view of the mine as they pass by. A long distance view of 29 miles is possible from the Ruby Mountain Wilderness Area to the southeast.

CULTURAL RESOURCES

Cultural resources are locations of past human activity, occupation, or use. Prehistoric resources reflect activities that occurred prior to introduction of written records. Since written documentation is absent, archaeological sites are the only source of data concerning prehistoric societies. Historic resources reflect Euro-American and Asian-American occupation. The scientific value of these resources relates to their potential to inform on how human societies operate and change. In addition to their scientific value, cultural resources may have aesthetic and cultural value. Aesthetic values may be expressed in rock art sites, or in standing structures of architectural significance. Historic sites may have cultural value if they link a living community to a place that conveys a sense of cultural identity.

PREHISTORIC OVERVIEW

James (1981), Elston and Budy (1990), Elston and Drews (1992), Schroedl (1995), Hockett and Morgenstein (2003), and McGuire *et al.* (2004) provide regional overviews of prehistory. Schroedl (1995) divides regional prehistory into six chronological periods. The Pre-Archaic Period (12,250 to 8,000 B.C.) was a period marked by cool, moist conditions. Originally thought to represent an adaptation to pluvial lakeshore environments, Pre-Archaic sites have been recognized in other settings.

Subsistence revolved around lakeshore-marsh resources and taking of large game. Population density was low, and groups were mobile. Sites in this period have not been identified in or adjacent to the proposed Project Area.

Environmental conditions changed toward the end of the Pre-Archaic as temperatures increased and available surface water decreased. The Early Archaic Period (8000 to 4500 B.C.) appears to have been a time of limited occupation in the north-central Great Basin. Period sites are few and not common regionally. The appearance of ground stone implements is evidence of subsistence diversification brought on by the reduced carrying capacity of local environments. Variety of site types encountered increased during this period, again suggesting resource procurement strategy diversity.

The Middle Archaic Period (4500 to 850 B.C.) corresponds to the onset of a cooler period when increased precipitation caused the expansion of some resources associated with lakes and marshes. Local manifestations of the Middle Archaic are referred to as the South Fork Phase. Trends during the period include population increases and broadening economic activities. While hunting was an important subsistence focus, the processing of plant foods took on greater importance as evidenced by the abundance of ground stone artifacts and increased use of upland resources.

The Late Archaic Period (850 B.C. and A.D. 700) corresponds with the James Creek Phase. Technologically, this period is marked by increased diversification in ground stone artifacts and a greater emphasis on the use of small flake tools. Subsistence and settlement changes appear to reflect increased local and regional population. This prompted an intensification and diversification in localized subsistence practices. Resources seldom used during earlier periods were added to the diet. Regional use of piñon became pronounced during this period.

The Late Prehistoric Period is divided into two sub-periods. The early sub-period (A.D. 700 to A.D. 1300) corresponds with the Maggie Creek Phase and exhibits a general continuity with the previous era. Occupation levels were consistent with, if not higher than, previous periods. The appearance of smaller Rosegate series projectile points suggests that the bow and arrow was introduced during this period. A general emphasis on smaller tools may evidence the gradual diminishment of quality lithics and/or a burgeoning population that forced an increased reliance upon the taking of smaller animals.

The latter sub-period of the Late Prehistoric (from A.D. 1300 to historic times) corresponds with the Eagle Rock Phase. Occupational levels appear to have declined during this period; assemblages are small in size and lack evidence of much diversity. Local materials are not abundant suggesting a mobile subsistence practice. This period saw expansion of Numic groups throughout most of the Great Basin from a homeland in the southwest. While there is little dispute that this event occurred, there is disagreement over its mechanics and timing.

HISTORICAL OVERVIEW

Patterson *et al.* (1969) and Vlasich (1981) represent sources that address local history. Topical references of relevance include Cline (1963) on early exploration; Cline (1974) on Peter Ogden; Goodwin (1965) on emigration; Myrick (1962) on railroads; Lincoln and Horton (1966), Elliot (1966), and Hill (1918) on mining; and Vestrom and Mason (1944), Sawyer (1971), and Young and Sparks (1985) on ranching and agriculture.

Economic interests fostered early exploration of the region. Acting on behalf of the Hudson's Bay Company, Peter Skene Ogden made several incursions into the Great Basin during the 1820s and 1830s. Others exploring the general Humboldt region included John Work and Joseph Walker. Exploration of a different sort occurred during the 1840s through the 1860s, when military expeditions traversed the region in search of scientific information or

transportation routes. Leaders of these expeditions included Captain John C. Fremont, Lieutenant E. Beckwith, Captain James Simpson, Clarence King, and Lieutenant George Wheeler.

Beginning in the 1840s, Euro-Americans moved through Nevada on their way to Oregon and California. The number of people moving along these trails swelled in the 1850s and 1860s, after the discovery of gold in California and then Nevada. The first Euro-American settlers in Nevada were traders that established posts along emigrant trails. Farmers, ranchers, and miners moved from these posts into the hinterlands. Construction of the transcontinental railroad in the 1860's saw establishment of new population centers and incentives for local and regional development. Nearby Carlin was established as a location for major railroad facilities.

Ready access to the railroad spurred development of the livestock industry throughout the state, but especially in northeast Nevada. Access to regional and national markets prompted an increased demand for extensive rangelands. Ranching operations in northeast Nevada came to depend on the ready availability of these lands for both summer and winter pasture. This pattern continued into the 1890s, after which the character of ranching shifted due to changes in federal land management, regional and national economics, and private land ownership patterns.

Mining has played a major role in the history of Nevada. While evidence of this industry is fairly ubiquitous across the state, there are areas ore bodies were discovered, prompting substantial levels of development. The general vicinity of the proposed Project Area reflects these patterns. The Railroad Mining District, located south of the proposed Project Area, was the nearest area that experienced a pronounced level of development. The district was organized in 1869, shortly after the discovery of silver ore. The towns of Highlands Camp and Bullion City were soon established. Similar to mineral deposits in the Eureka area, ores from the Railroad District required smelting. The first smelter was erected in 1870 and upgraded smelters began operation in 1872. The district produced regularly through the 1870s and early 1880s, yielding more than $3,000,000 in silver, lead, copper, and gold (Paher 1970). The mines were reopened in 1904 and produced intermittently through the 1910s (Emmons 1910; Lincoln and Horton 1966; Couch and Carpenter 1943).

CULTURAL RESOURCE PROJECTS IN AREA OF POTENTIAL EFFECT

Compliance with regulations affecting cultural resources requires definition of an Area of Potential Effect (APE). For the proposed Emigrant Project, the Permit Boundary is defined as the APE (see **Figure 2-2**). This area is further divided into areas that would be subject to direct impacts (the Proposed Disturbance Boundary) and areas that could be subject to indirect impacts (outside the Proposed Disturbance Boundary but within the Permit Boundary). Certain classes of cultural resources could be subject to impact even if located outside the Permit Boundary. For example, resources eligible to the National Register based on criteria A, B, or C may be impacted due to the introduction of visual or audible intrusions. Also, increased access and visibility may result in increased vandalism.

Archival data were collected to determine the location and nature of prehistoric, historic, and architectural resources known to be present within both the direct and indirect impact portions of the APE. Project and site records maintained by BLM were examined. **Table 3-25** lists the sixteen intensive (Class III) inventories that have been conducted within or that overlap some portion of the APE. As a result of those inventories, the entire APE has been examined for the presence of cultural resources.

TABLE 3-25 Previous Cultural Resource Studies Conducted in Area of Potential Effect			
BLM Report Number	Author	Date	General Project Area
1-337	Nelson	1980	Tram Line
1-408	Rieger	1981	Emigrant Gravel Pit
1-447	Ellis and Tullis	1981	Seismic Lines
1-1026	Clay and Furnis	1986	Rain Project Area
1-1121	Burke	1987	Utility Corridor, Rain Project
1-1613	Newsome	1997	East of Emigrant Springs
1-1627	Newsome and Schroedl	1992	Emigrant Parcel
1-1706	Deitz	1992	Fire Rehabilitation Fence
1-1769	Tipps and Newsome	1993	Emigrant Parcel Addition
1-1774	Dillingham and Hockett	2000	Emigrant Springs Probing
1-1862	Whisenhunt	1994	Emigrant Aspen Enclosure
1-1920	Newsome	1994	Emigrant Springs Area
1-2067	Wiseman and Braley		Mud Springs Fence
1-2157	Schroedl	2001	Emigrant Springs Data Recovery
1-2324	Birnie	2003	Emigrant Parcels
1-2376	Birnie, Knoll, Tipps, and Field	2004	Emigrant Addition

Cultural resources present within the Proposed Disturbance Boundary are listed in **Table 3-26.** Forty-two sites have been recorded, of which 22 are prehistoric period sites and 20 are prehistoric period isolates. No historic period sites or isolates have been recorded within this portion of the APE. Of the prehistoric sites, one contains a component that can be assigned to a specific period. That component represented the Proto-historic period. The BLM, in consultation with the Nevada State Historic Preservation Office, has determined that three of the identified sites (CrNV-12-13259, 13261, and 13272) are eligible for listing on the National Register of Historic Places. As noted in a state protocol agreement between BLM and the Nevada State Historic Preservation Office, isolated artifacts and features are categorically ineligible for listing on the National Register.

Cultural resources present within the area outside the Proposed Disturbance Boundary but within the Permit Boundary are listed in **Table 3-27**. Forty-seven sites have been recorded in this area. Of those, 28 are prehistoric period sites, 18 are prehistoric period isolates, and one is a historic period isolate. Of the prehistoric period sites, eight contain one or more components that can be assigned to a specific period. Periods represented by components include the Middle and Late Archaic, and the Proto-historic. The BLM, in consultation with the Nevada State Historic Preservation Office, has determined that nine of the identified sites (CrNV-12-11043, 13254, 13255, 13258, 13260, 13264, 13265, 13269, and 13270) are eligible for listing on the National Register of Historic Places.

TABLE 3-26 Previously Identified Cultural Resources Within Proposed Disturbance Boundary				
Site Number (CrNV-12-)	**Site Period**	**Site Type**	**Report Reference**	**National Register Eligibility**
6226	Prehistoric	Lithic Scatter	CRR 1-1121 & 1-1627	Not Eligible
11022	Prehistoric	Lithic Scatter	CRR 1-1627	Not Eligible
11026	Prehistoric	Lithic Scatter	CRR 1-1627	Not Eligible
11028	Prehistoric	Lithic Scatter	CRR 1-1627	Not Eligible
11029	Prehistoric	Lithic Scatter	CRR 1-1627	Not Eligible
11040	Prehistoric	Lithic Scatter	CRR 1-1627	Not Eligible
11042	Prehistoric	Lithic Scatter	CRR 1-1627	Not Eligible
11044	Prehistoric	Lithic Scatter with Ground Stone	CRR 1-1627	Not Eligible
11045	Prehistoric	Lithic Scatter	CRR 1-1627	Not Eligible
11046	Prehistoric	Lithic Scatter	CRR 1-1627	Not Eligible
11047	Prehistoric	Lithic Scatter	CRR 1-1627	Not Eligible
11048	Prehistoric	Lithic Scatter	CRR 1-1627	Not Eligible
11049	Prehistoric	Lithic Scatter	CRR 1-1627	Not Eligible
11060	Prehistoric	Lithic Scatter	CRR 1-1627	Not Eligible
11542	Prehistoric	Lithic Scatter	CRR 1-1769	Not Eligible
11543	Prehistoric	Lithic Scatter	CRR 1-1769	Not Eligible
11941	Prehistoric	Lithic Scatter with Ground Stone	CRR 1-1920	Not Eligible
11942	Prehistoric	Lithic Scatter	CRR 1-1920	Not Eligible
13256	Prehistoric	Lithic Scatter	CRR 1-2376	Not Eligible
13259	Prehistoric	Lithic Scatter	CRR 1-2376	Eligible (d)
13261	Prehistoric	Lithic Scatter with Ground Stone	CRR 1-2376	Eligible (d)
13272	Prehistoric – Proto-historic	Lithic Scatter	CRR 1-2376	Eligible (d)
Isolates				
EIF – 1226	Prehistoric	Debitage	CRR 1-1627	Not Eligible
EIF – 1227	Prehistoric	Debitage	CRR 1-1627	Not Eligible
EIF – 1242	Prehistoric – Elko	Projectile Point	CRR 1-1627	Not Eligible
EIF – 1243	Prehistoric	Biface Fragment	CRR 1-1627	Not Eligible
EIF – 1244	Prehistoric	Core	CRR 1-1627	Not Eligible
EIF – 1247	Prehistoric	Biface Fragment	CRR 1-1627	Not Eligible
EIF – 1248	Prehistoric	Biface Fragment	CRR 1-1627	Not Eligible
EIF – 1249	Prehistoric	Debitage	CRR 1-1627	Not Eligible
EIF – 1260	Prehistoric	Core	CRR 1-1627	Not Eligible
EIF – 1262	Prehistoric – Elko	Projectile Point	CRR 1-1627	Not Eligible
EIF – 1263	Prehistoric	Biface Fragment	CRR 1-1627	Not Eligible
EIF – 1265	Prehistoric	Debitage	CRR 1-1627	Not Eligible
EIF – 1692	Prehistoric	Point Fragment	CRR 1-1613	Not Eligible
EIF – 1725	Prehistoric	Debitage	CRR 1-1769	Not Eligible
EIF – 4679	Prehistoric	Debitage	CRR 1-2376	Not Eligible
EIF – 4680	Prehistoric	Debitage	CRR 1-2376	Not Eligible
EIF – 4681	Prehistoric	Modified Flake	CRR 1-2376	Not Eligible
EIF – 4682	Prehistoric	Modified Flake	CRR 1-2376	Not Eligible
EIF – 4683	Prehistoric – Elko	Projectile Point	CRR 1-2376	Not Eligible
EIF – 4690	Prehistoric	Debitage	CRR 1-2376	Not Eligible

TABLE 3-27 Previously Identified Cultural Resources Outside Disturbance Boundary, But Within Permit Boundary				
Site Number (CrNV-12-)	**Site Period**	**Site Type**	**Report Reference**	**National Register Eligibility**
5404	Prehistoric – Middle & Late Archaic	Large Lithic Scatter	CRR 1-1026	Not Eligible
5440	Prehistoric	Lithic Scatter	CRR 1-1026	Not Eligible
6227	Prehistoric – James Creek	Lithic Scatter with Ground Stone	CRR 1-1121 & 1-1627	Not Eligible
11023	Prehistoric	Lithic Scatter	CRR 1-1627	Not Eligible
11024	Prehistoric	Lithic Scatter	CRR 1-1627	Not Eligible
11025	Prehistoric	Lithic Scatter	CRR 1-1627	Not Eligible
11027	Prehistoric	Lithic Scatter	CRR 1-1627	Not Eligible
11041	Prehistoric – Late Archaic	Lithic Scatter	CRR 1-1627	Not Eligible
11043	Prehistoric	Lithic Scatter	CRR 1-1627	Eligible (d)
11061	Prehistoric – Late Archaic	Lithic Scatter	CRR 1-1627	Not Eligible
11062	Prehistoric	Lithic Scatter	CRR 1-1627	Not Eligible
11269	Prehistoric	Lithic Scatter	CRR 1-1706	Not Eligible
11269	Prehistoric	Lithic Scatter	CRR 1-1920	Not Eligible
13254	Prehistoric	Lithic Scatter with Ground Stone	CRR 1-2376	Eligible (d)
13255	Prehistoric	Lithic Scatter with Ground Stone	CRR 1-2376	Eligible (d)
13257	Prehistoric	Lithic Scatter	CRR 1-2376	Not Eligible
13258	Prehistoric	Lithic Scatter with Ground Stone	CRR 1-2376	Eligible (d)
13260	Prehistoric – Middle Archaic	Lithic Scatter	CRR 1-2376	Eligible (d)
13262	Prehistoric	Lithic Scatter	CRR 1-2376	Not Eligible
13263	Prehistoric	Lithic Scatter	CRR 1-2376	Not Eligible
13264	Prehistoric	Lithic Scatter	CRR 1-2376	Eligible (d)
13265	Prehistoric – Late Prehistoric	Lithic Scatter	CRR 1-2376	Eligible (d)
13266	Prehistoric	Lithic Scatter	CRR 1-2376	Not Eligible
13268	Prehistoric	Lithic Scatter	CRR 1-2376	Not Eligible
13269	Prehistoric – Proto-historic	Lithic Scatter	CRR 1-2376	Eligible (d)
13270	Prehistoric – Late Archaic, Proto-historic	Lithic Scatter with Pottery	CRR 1-2376	Eligible (d)
13271	Prehistoric	Lithic Scatter with Ground Stone	CRR 1-2376	Not Eligible
13273	Prehistoric	Lithic Scatter	CRR 1-2376	Not Eligible
Isolates				
EIF-1225	Prehistoric	Debitage	CRR 1-1627	Not Eligible
EIF-1228	Prehistoric	Scraper	CRR 1-1627	Not Eligible
EIF-1229	Prehistoric – Gypsum	Projectile Point	CRR 1-1627	Not Eligible
EIF-1240	Prehistoric	Debitage	CRR 1-1627	Not Eligible
EIF-1241	Prehistoric	Debitage	CRR 1-1627	Not Eligible
EIF-1245	Prehistoric	Debitage	CRR 1-1627	Not Eligible
EIF-1246	Prehistoric	Debitage	CRR 1-1627	Not Eligible
EIF-1261	Prehistoric – Elko	Projectile Point	CRR 1-1627	Not Eligible
EIF-1264	Prehistoric	Debitage	CRR 1-1627	Not Eligible
EIF-1726	Prehistoric	Debitage	CRR 1-1769	Not Eligible

TABLE 3-27 (continued) Previously Identified Cultural Resources Outside Disturbance Boundary, But Within Permit Boundary				
Site Number (CrNV-12-)	Site Period	Site Type	Report Reference	National Register Eligibility
EIF-2344	Prehistoric - Gatecliff	Projectile Point	CRR 1-1920	Not Eligible
EIF-4684	Prehistoric	Stone Tool	CRR 1-2376	Not Eligible
EIF-4685	Prehistoric	Debitage	CRR 1-2376	Not Eligible
EIF-4686	Prehistoric	Ceramic	CRR 1-2376	Not Eligible
EIF-4687	Prehistoric	Debitage	CRR 1-2376	Not Eligible
EIF-4688	Prehistoric	Debitage	CRR 1-2376	Not Eligible
EIF-4689	Prehistoric	Debitage	CRR 1-2376	Not Eligible
EIF-4691	Historic	Hole-in-cap can	CRR 1-2376	Not Eligible
EIF-4692	Prehistoric - Humboldt	Projectile Point	CRR 1-2376	Not Eligible

One resource within the proposed Permit Boundary has been the subject of detailed study. Site CrNV-12-11043 was first recorded by Newsome and Schroedl (1992) and subsequently tested by Dillingham and Hockett (2000). Based on that work, it was recommended the site is National Register eligible and treatment should occur in advance of a proposed land exchange. A treatment plan was prepared by Tipps and Bright (2000) and implemented by Schroedl (2001).

Clay and Furnis (1986) located sites CrNV-12-5404 and 5440 in the area now occupied by the Rain Tailing Storage Facility, and in proposed Borrow Area #3. Those sites, determined not to be National Register eligible, were eradicated during development of the storage facility. Although listed in **Table 3-27**, these resources are no longer of management concern.

NATIVE AMERICAN CONCERNS

In accordance with Federal legislation and executive orders, Federal agencies must consider the impacts their actions may have to Native American traditions and religious practices. Consequently, the BLM must take steps to identify locations having traditional/cultural or religious values to Native Americans and insure that its actions do not unduly or unnecessarily burden the pursuit of traditional religion or traditional lifeways.

The National Historic Preservation Act (P.L. 89-665), the National Environmental Policy Act (P.L. 91-190), the Federal Land Policy and Management Act (P. L.94-579), the American Indian Religious Freedom Act (P.L. 95-341), the Native American Graves Protection and Repatriation Act (P.L. 101-601) and Executive Order 13007 require that the BLM provide tribes opportunities to actively participate in the decision making process.

The proposed location of the Emigrant Project Area lies within the traditional territory of the Western Shoshone. However, BLM has limited information regarding any specific spiritual/cultural/traditional activities and sites or Traditional Cultural Properties within or in close proximity to the project boundary. Ethnographic sources that discuss Western Shoshone in broad terms, but do not include ethnographic information tied specifically to the Project Area include: Chamberlain (1911), Steward (1937, 1938, 1941, and 1943), and Harris (1940). Murphy and Murphy (1960), the Inter-Tribal Council of Nevada (1976), Janetski

(1981), Thomas *et al.* (1986), and Crum (1994) provide recent ethnographic reviews. Information on world view and religious beliefs is contained in Miller (1983a, 1983b), Hultkrantz (1986), Clemmer (1990), and Rusco and Raven (1992).

ETHNOGRAPHIC BACKGROUND

The Western Shoshone, members of the Uto-Aztecan linguistic family, inhabited an area extending from southeast California into northwest Utah. Their territory was bordered to the north by the Northern Shoshone, to the east by the Ute, to the south by the Southern Paiute, and to the west by the Northern Paiute.

The nuclear family was the basic unit of Shoshone society. Nuclear families conducted most subsistence activities and were largely self-sufficient. Three to ten families jointly occupied semi-permanent camps during the winter months and foraged together for parts of the year. The Shoshone joined into larger groups only when resources were sufficiently concentrated to allow cooperative harvests. These gatherings were often the occasion for fandangos, festivals that provided an opportunity for courtship, socializing, and dancing.

The Shoshone used a flexible subsistence and settlement system, one based on the scheduling of activities according to the seasonal availability of food. In the spring, Shoshone dispersed in family groups each of which foraged for greens and roots on valley floors. Small mammals were an important meat source that could be hunted with bow and arrow, snares, or deadfalls. In some cases, burrows were flooded or the animals were dug out.

Summer gathering strategies focused on ripening grass seeds. These became available on valley bottoms first and then upslope as the season progressed. Seeds were harvested either by knocking them into burden baskets or by cutting seed heads from stalks. Seeds were winnowed, ground, and either prepared for consumption or stored. Berries and roots were gathered in late summer and early fall. Small animals continued to be an important resource through out the summer. Small groups ambushed mountain sheep from blinds, while individual hunters often stalked deer.

The character of the subsistence pattern changed in the fall. Multiple families assembled to procure large amounts of food for storage at winter base camps. Piñon was an important plant resource in the fall. Long hooked poles were used to shake cones from trees, while other cones could be picked from the ground. As necessary, cones were roasted to release the seeds. Cones often were stored in aboveground caches or open pits, while nuts were stored in sealed underground pits. Groups often traveled long distances to secure the seeds, which were then transported back to winter village sites. After the piñon harvest, people sometimes gathered for antelope and jackrabbit drives on valley bottoms. Jackrabbits were driven into nets where they were clubbed. Antelope were driven into large corrals and then dispatched by archers. Western Shoshone also made occasional forays to the Snake River to fish for salmon during the fall spawning run.

The Shoshone depended on stored food during winter months. Piñon and other stored seeds could be supplemented by collecting cactus and the roots of marsh plants such as cattails and bulrush. Mountain sheep could be hunted at lower elevations in the winter and ice fishing sometimes occurred along the Humboldt River.

WORLD VIEW

The Western Shoshone trace their occupation of the Great Basin back to when the earth was young—back to when "animals were people"

(Miller 1983a). The coyote and wolf figure in creation stories, with prominent mountain peaks honored as sacred places connected with their creation.

The belief that supernatural power (*Puha*) has permeated the earth since its creation is a central feature in Western Shoshone religious beliefs. Religious behavior revolves around the acquisition of *Puha*. Sources of *Puha* are numerous, including sources of water, prominent mountain peaks, and caves. Animals and, to a lesser extent, plants have power and this power can be conveyed to people by supernatural spirits who control individual species. Because power is attracted to life, it remains present in places where people have lived, particularly around graves. Power sources are associated with spirits. As noted, animal and plant species have spirits, and fixed places such as water sources, mountains, caves, are viewed as power spots. Other forms of spirits include guardian spirits and little men.

Religious expression takes several primary forms: ceremonies; individual prayer to the spirits of plants, animals, water, power spots, and little men; and use of power spots for vision questing (acquisition of a guardian spirit); curing; and doctoring. The most frequent form is the individual prayer. Prayer is especially important in connection with places where spirits may live, or that are regarded as power spots. Individuals who exhibit discipline and strength may obtain special power. Most people participated in a variety of rituals associated with hunting, gathering, attending a birth, or burying and mourning the dead.

Power also may be used for non-legitimate, malevolent, purposes. Also, certain spirits may, in some circumstances, act in a malevolent manner. For example, little men can be benevolent or malevolent, depending on how they are treated. Correcting neglected or abused relationships between humans and spirits is a major aspect of Western Shoshone religion. Many rituals are directed at controlling and use of power and balancing the potentially dangerous spiritual powers that pervade nature. Shoshone religion depends on maintaining the integrity of power spots, maintaining the presence of little men, maintaining their relationship with the owner-spirits of plants and animals, and maintaining life-giving forces such as the sun, earth, and water.

CONSULTATION ACTIVITIES

The BLM Elko Field Office initiated formal Native American consultation by sending a notification letter to the following groups: Te-Moak Tribe of Western Shoshone Tribal Chair and Environmental Department, Battle Mountain Band Chair and Environmental Department, Elko Band Chair and Environmental Department, South Fork Band Chair and Environmental Department, Wells Band Chair and Environmental Department, Duck Valley Sho-Pai Tribe Chair and Cultural Resources Department, and the Dann Family. A field tour to the project site, with participating tribal entities, was also conducted on June 7, 2004. Since that time, the South Fork, Wells, Elko, and Battle Mountain Bands remained the most active via phone, email, informal meeting, and field tour communication. Detailed Tribal coordination and communication files are on file at the BLM Elko Field Office and are considered confidential.

To date, formal and informal consultation efforts have not identified any specific Western Shoshone Traditional Cultural Properties within or in close proximity to the Emigrant Project boundary. However, participating tribal entities have expressed great concern regarding the proposed diversion of a stream to allow for mining activities within the Emigrant Mine pit. Since the stream intermittently flows into Dixie Creek, which is a tributary of lower South Fork Humboldt River, water quality concerns are shared by all parties.

South Fork Band of the Te-Moak Tribe of the Western Shoshone Environmental Department hand-delivered their comments regarding the Emigrant Project to BLM on October 18, 2004 (see **Table 1-2**).

SOCIAL AND ECONOMIC RESOURCES

The region of influence (Study Area) for socioeconomic effects encompasses Elko County and the communities of Elko, Carlin, and the Elko Band Colony. The Study Area is defined as the geographical area in which the principal direct and indirect socio-economic effects of the Proposed Action and Alternatives for the Emigrant Project are likely to occur. The purpose of documenting the socio-economic setting of the Study Area is to provide an understanding of the social and economic forces that have shaped the area and to provide a frame of reference necessary to estimate the economic effects of the Proposed Action and Alternatives.

SOCIAL LIFE

The socioeconomic character and cultural diversity of Elko County and surrounding northeastern Nevada reflects a history of occupations and nomadic use by Native Americans followed by the advancement of the railroad and an influx of explorers and settlers. An important change in the Elko economy came with Nevada's legalization of casino gambling in 1931. Gaming and entertainment in Elko County casinos are highly visible social and economic institutions.

Mining has been a source of income in Elko County since the 1850s. Mining and related development in the 1980s and 1990s caused rapid population growth in the City of Elko and Carlin and was a dominant force in shaping the socioeconomic character of the area. The in-migration of new residents has created changes in some aspects of daily life, such as increased traffic, overcrowded parks, and higher crime rates. Low unemployment rates, greater diversity of services, and increased business opportunities were also a result of increased economic development.

With a population of more than 50,000, Elko County, located in the northeastern corner of Nevada, is a growing area with a high quality of life. It contains the cities of Carlin, Elko, Spring Creek, Wells, and West Wendover as well as the unincorporated communities of Jackpot, Montello, and Mountain City. The area has a very strong sense of community and the citizens enjoy a satisfying four-season climate, moderate cost of living, 120 acres of public parks, quality education and health care, and strong economic growth.

Elko is the largest urban area and center of commerce and government in northeastern and north central Nevada. The town serves as the county seat for Elko County, the sixth largest county in the country (ECEDA 2004).

Carlin is the gateway to the world's largest gold mines. Mining became a major employment base in the early 1960s. The mining area, commonly known as the Carlin Trend, boasts two of the largest open pit gold mines in the world.

Social stratification in the area is often defined by income, length of residence, educational background, and ethnicity. Local residents earning high incomes are considered to be the most influential in the community. The most powerful groups viewed by residents as making decisions about the area's future include federal and state government, county commissioners, environmental organizations, and large corporations (BLM 2002)

POPULATION TRENDS AND DEMOGRAPHIC CHARACTERISTICS

Nevada has experienced tremendous growth over the last decade, and it is ranked as one of the fastest growing states (U.S. Bureau of the Census 2004).

Similar to the state, Elko County's population has increased considerably from 1990 (33,530) to 2000 (45,291), a 35 percent increase. The county did experience a negative growth from July 2001 until July 2003 (-0.95%). The City of Elko experienced growth of 13 percent in population between 1990 (14,736) and 2000 (16,708). The City of Elko has not experienced growth over the last several years, and in fact, has decreased in population to an estimated 16,354 residents. Population in Carlin, the community closest to the mine site, decreased by 3 percent from 2,220 in 1990 to 2,161 in 2000 and is estimated to be 2,045 residents in July 2003 (U.S. Bureau of the Census 2001; Nevada State Demographer's Office 2004).

The demographics of Elko County differ from the state (**Table 3-28**) with respect to gender (a higher percent of males than females in the county than in the state); age (a higher population of residents less than 18 years of age in the county than in the state); and ethnicity (higher percent of Caucasian and Native American populations in the county than in the state)(Nevada State Demographer's Office 1986-2003, 1990-2003).

Tribal enrollment of the Elko Band Colony increased nine percent between 1995 (1,326 enrolled members) and 1997 (1,445 residents). Forty-three percent of the enrolled members live on or near the colony. In 1997, 29.4 percent of colony residents were under 16 years of age, 64.4 percent were between 16 and 64 years old, and 6.2 percent were 65 years and older (U. S. Bureau of Indian Affairs 2001).

TABLE 3-28
Demographic Estimates for State of Nevada and Elko County 2003

	Nevada	Percent in Nevada	Elko County	Percent in Elko County
Gender				
Male	1,163,371	51%	23,830	52%
Female	1,127,065	49%	21,975	48%
Age				
5 Years of Age	32,577	2%	653	2%
6 to 18 Years of Age	416,440	19%	9851	23%
19 to 64 Years of Age	1,424,496	67%	29,451	68%
65 Years of Age and Over	254,702	12%	3053	7%
White not of Hispanic Origin	1,460,035	64%	33,716	73%
Black not of Hispanic Origin	158,055	7%	321	1%
American Indian, Eskimo, or Aleut Indian not of Hispanic Origin	30,959	1%	2,365	5%
Asian or Pacific Islander not of Hispanic Origin	138,009	6%	412	1%
Hispanic Origin of any Race	503,378	22%	8,992	20%

Source: Nevada State Demographers Office 2004.

HOUSING

In 2000, there were 18,456 housing units in Elko County; 85 percent were occupied, and 15 percent were vacant. Of the occupied housing units, 70 percent were owner-occupied and 30 percent renter-occupied. In 2002 estimates for Elko County included 18,732 housing units, of which 70 percent were owner-occupied. (U.S. Bureau of the Census 2004)

COMMUNITY SERVICE PROVIDERS

EDUCATION

There are 13 schools in the socioeconomic Study Area, all within Elko County School District. The seven elementary schools located in Elko (Elko Grammar School 2, Mountain View Elementary School, Northside Elementary School, Sage Elementary School, Southside Elementary School, and Spring Creek Elementary) and the Mound Valley Elementary School in Jiggs provide education to students enrolled in kindergarten through grade 5 or 6. Elko Junior High School serves grades 7 and 8, and Spring Creek Middle School serve grades 6 through 8, while Elko High School and Spring Creek High school serve grades 9 through 12 (Greatschools 2004)

The Carlin elementary school provides education to students in kindergarten through grade 6, and Carlin High School serves students enrolled in grades 7 through 12. Education of children in kindergarten through grade 12 from the Elko Band Colony is provided through the Elko County School District. Great Basin College is a community college offering several 4-year degrees. A Head Start Program is housed and operated at the Colony for children aged 3 through 5. Under contract with the BIA, the Elko Band Council provides higher education and an adult vocational program at the Colony.

LAW ENFORCEMENT

The Nevada Highway Patrol, Elko County Sheriff's Department, Elko City Police, Carlin City Police, and Bureau of Indian Affairs (BIA) Police provide law enforcement services to community residents. The Highway Patrol is responsible for law enforcement activities on state highway systems. The Sheriff's Department is accountable for Elko County including the unincorporated towns (17,135 square miles) and is aided in search and rescue operations and emergency situations by the Sheriff's Posse and Reserves. The Elko County Jail, operated by Elko County Sheriff's Department, is located in Elko. (BLM 2002)

The Elko and Carlin City Police are restricted to the city limits (Approximately 14 square miles and 9 square miles, respectively). The BIA Police is accountable for law enforcement on the Elko Band Colony (192.8 acres).

FIRE PROTECTION

Fire protection in the cities of Elko and Carlin is provided by the Elko City Fire Department, Carlin City Volunteer Fire Department (a combined fire, ambulance, and rescue unit), BLM, USFS, and Northeastern Fire Protection Department of the Nevada Division of Forestry. The Elko and Carlin fire departments primarily serve residents within their city limits and the Elko Band Colony; however, both departments maintain mutual aid/cooperative agreements with other firefighting agencies in the area. The BLM is primarily responsible for fighting wildland fires. (BLM 2002)

AMBULANCE SERVICES

Ambulance services are available in Elko and Carlin for ground transportation of patients. Fixed-wing ambulance aircraft is also available at the Elko Airport.

HEALTH CARE

The Northeastern Nevada Regional Hospital opened in September 2001. The hospital is situated on a 50-acre medical campus in the City of Elko. Services at the hospital include 24-hour emergency care, physical therapy, full-service laboratory, intensive care unit, pediatric unit, inpatient pharmacy, obstetrics and gynecology, 24-hour radiology, MRI and CAT Scan, nuclear medicine, mammography, ultrasound, chemotherapy, neurology, sleep medicine program, inpatient and outpatient surgery, cardio-pulmonary therapy, pulmonary function testing, stress treadmill testing, and nutrition counseling (Northeastern Nevada Regional Hospital 2004).

The hospital, under contract with the Indian Health Service (IHS), provides medical care and emergency services to Native Americans. In addition, comprehensive medical care through IHS is provided at the Elko Band Colony by the Health Center which opened in July 1992. The Center houses a pharmacy, dental rooms with a laboratory, and other support services.

PUBLIC ASSISTANCE

Public assistance in Elko County is provided by Elko County Social Services and the Nevada State Welfare Department. Other smaller organizations also provide temporary assistance to residents suffering hardships. The Elko Band Council, under contract with the BIA, provides eligible Native Americans with general welfare assistance, adult institutional care, Indian child welfare (including foster care and institutional placements), indigent burial assistance, counseling services, and assistance with Social Security, disability, and death benefits, and state Medicare and Medicaid benefits. (BLM 2002)

WATER SUPPLY

Elko City water is provided from 18 deep-water wells. The water is stored in 10 storage tanks with a total capacity of 25 million gallons. A deep well and natural springs provide Carlin City's water supply. The water is stored in a 2-million-gallon tank.

WASTEWATER TREATMENT FACILITIES

Both Elko and Carlin have wastewater treatment facilities.

SOLID WASTE

The regional landfill in the City of Elko is the only landfill in the county. The estimated life of the landfill, at 1,000 tons of solid waste per day, is approximately 94 years. Currently, the landfill is taking approximately 110 tons of solid waste per day (NDEP 2004b).

ENERGY GENERATION AND DISTRIBUTION SYSTEMS

Sierra Pacific Power Company provides electrical service in the Project Study Area. Natural gas in the Study Area is provided by Southwest Gas Corporation.

EMPLOYMENT

In 2003, employment in Nevada was dominated by the service industries (50%) and specifically the leisure and hospitality industries with 29 percent of the workforce in the sector. The gaming industry drives Nevada's economy. Gaming, hotel, and recreation areas employ the largest numbers of workers in the state (303,680). The next largest employment sector is trade, transportation, and utilities with 18 percent of the jobs statewide. Approximately one percent of jobs statewide were in the natural resource and mining industries (Nevada Department of Employment, Training, and Rehabilitation 2004).

Mining has always been and continues to be important to the economic well-being of Nevada. Nevada has led the nation in the production of gold, silver, and barite. The average number of mining jobs in 2002 for the state of Nevada was 8,861 and the average number of mining jobs in Elko County was 1,403 (7.7 percent of the total average employment in Elko County).

INCOME

Jobs associated with the mining industry are some of the highest paying jobs in the state ($62,333 average annual wages statewide in 2002), while jobs associated with the service industry average approximately $19,000 annually. In 2002, the annual average wage in the mining industry was $53,375 in Elko County (Nevada Department of Employment, Training and Rehabilitation 2004). Per capita personal income in Nevada in 1999 was $21,989, compared with $18,482 for Elko County (U.S. Bureau of the Census 2004).

GOVERNMENT AND PUBLIC FINANCE

The major governing bodies in Elko County include Elko County Commissioners, Elko County Planning Commission, Elko County School District, City of Elko, City of Carlin, and the Tribal Council of the Elko Band Colony-Te-Moak Tribe of the Western Shoshone Indians.

The state of Nevada collects taxes for many activities. Primary contributors to Nevada include gaming, sales, and use taxes. Mines are among the highest taxed industries in the state. Mining is the only industry that pays taxes to state and local governments on the basis of net proceeds. Mineral producers are allowed to deduct direct costs of production, such as mining and milling, and are only taxed on the remaining net amount. Newmont paid approximately $92,364 in taxes on net proceeds in Fiscal Year (FY) 2000 to Elko County (Nevada Department of Taxation 2004).

The biggest share of FY 2000 revenues for Elko County, 37 percent, came from inter-governmental revenues, while property taxes provided about 24.5 percent of Elko County revenues. Net proceeds accounted for $2,572,000 in FY 2000 revenues for Elko County. The majority of the expenditures were for public safety (36.6%), general government (27%), judicial (24.9%), operating transfers out (5.0%), and public works (3.3%). Revenues exceeded expenditures in FY 2000 by $1,855,365 (Nevada Department of Taxation 2004).

Newmont Gold Company was among the ten highest property tax payers in the state of Nevada and was the highest among mining companies in 2000. Their secured assessed value in 2000 was $369,772,350 (Nevada Department of Taxation 2004).

ENVIRONMENTAL JUSTICE

Executive Order 12898 directs federal agencies to identify and address disproportionately high and adverse human health or environmental effects that their programs might impose on minority and low-income populations. Data presented herein are drawn from the 2000 federal census. Environmental Protection Agency (EPA 1998) and Council on Environmental Quality (CEQ 1997) guidelines for the conduct of environmental justice assessments were followed when preparing the present analysis. Census data were reviewed for census tracts in which the Proposed Action is to be located, and for tracts that surround facilities associated with the Proposed Action.

Minority populations enumerated in the census include Blacks; American Indians, Eskimo or Aleut; Asian or Pacific Islanders; Hispanics; and

others. A census tract or block will be defined as having a disadvantaged population if the proportion of its population within any category equals or exceeds 1.5 times the percentage for the county as a whole. For example, a countywide Black population is nine percent. Any census tract or block in which the Black population is 13.5 percent or higher will be considered to have a disadvantaged population. This method is considered to be a conservative approach appropriate for a screening level assessment such as that presented herein.

The low-income level is defined as the percentage of families with a gross yearly income below the 1999 poverty level. In that year, the average poverty threshold for a family of four in the 48 contiguous states was $16,700 (Federal Register 1999).

The Proposed Action is located in Block Group 1 of Census Tract 9516. Interstate Highway 80 (I-80) defines the north edge of the block group. The east edge extends circuitously from I-80 south along Dixie Creek. The west edge follows Nevada State Route 278 (SR 278) through Pine Valley. The Emigrant Project is located approximately in the center of the block group. Portions of the community of Carlin located south of I-80 are included in this block group. The Proposed Action extends into two census blocks (1190 and 1229). Twenty other census blocks are located in the area immediately surrounding the Emigrant Project (1088, 1184, 1189, 1190 through 1194, 1205 through 1210, 1225 through 1228, and 1230 through 1233). Review of the 2000 census revealed that of 22 census tract blocks located within the immediate vicinity of the Emigrant Project, none are populated. As a result, Block Group 1 of Census Tract 9516 will be reviewed as the potentially impacted population.

MINORITY COMPOSITION

Information regarding the ethnic composition of populations located within Block Group 1 is provided in **Table 3-29**. Comparative information is also provided for Elko and Eureka counties, and the state of Nevada. As noted above, a census tract or block will be defined as having a disadvantaged population if the proportion of its population within any category equals or exceeds 1.5X the percentage for Elko County as a whole.

Elko County is representative of the State of Nevada with exception of American Indians (5% for the county as compared to 1% for the state). Neighboring Eureka County contains relatively few representatives of minority populations. When compared to Elko County data, census Tract 9516 exhibits a population that is not diverse ethnically. Whites are predominant (90% within the tract, as compared to 82% for Elko County). Census Tract 9516 does exhibit an elevated percentage of Blacks (2%for the tract as compared to 1% for Elko County).

Block Group 1 of Census Tract 9516 continues this pattern (4% Blacks for the tract as compared to 1% for Elko County). For the purpose of screening for environmental justice concerns, the Black population in Block Group 1 of Census Tract 9516 would represent a minority population as defined by EPA's guidelines (1998). As noted previously, census blocks located in and around the Emigrant Project are not populated; they do not contain representatives of this potential minority population. As a result, the Proposed Action would not have the potential to disproportionately impact a minority population located elsewhere in the block group.

The community of Carlin is located partially within Block Group 1 of Census Tract 9516. The town, identified in the census as a "place," was summarized separately (**Table 3-29**) to determine if disproportionately large ethnic populations are present there. Review of that data indicates that ethnic populations are

TABLE 3-29
2000 Ethnic Composition of the Project Area and State of Nevada Populations

Location	White			Black			American Indian, Eskimo, or Aleut			Asian or Pacific Islander			Other Race or Mixed Race			Total Pop.
	Qty	% of Total	% Hisp.	Qty	% of Total	% Hisp.	Qty	% of Total	% Hisp.	Qty	% of Total	% Hisp.	Qty	% of Total	% Hisp.	
Nevada	1,501,886	75%	13%	135,477	7%	3%	26,420	1%	19%	98,692	5%	2%	235,782	12%	78%	1,998,257
Elko County	37,159	82%	12%	267	1%	4%	2,400	5%	10%	358	1%	4%	5,107	11%	84%	45,291
Eureka County	1,474	89%	5%	7	1%	14%	26	2%	4%	14	1%	0%	130	8%	65%	1,651
Carlin	1,986	92%	5%	1	1%	0%	38	2%	0%	14	1%	0%	122	6%	70%	2,161
Tract 9516	2,117	90%	5%	43	2%	0%	40	2%	0%	14	1%	0%	133	6%	71%	2,347
Block Group 1	944	90%	5%	42	4%	0%	15	1%	0%	1	1%	0%	46	4%	65%	1,048

1. U.S. Bureau of the Census 2000a. Summary File 1 (SF 1)-100 Percent Data, Map and Detailed Tables: P3 Race Tables and P4 Hispanic or Latino by Race at http://factfinder.census.gov/.
2. Numbers and percentages in this table were obtained as follows from Detailed Table P3 and P4 data by geographic unit.
Percent of Total: example continued, White Qty ÷ Total = % of Total Percent Hispanic: example continued, (Hispanic or Latino {P4} - White Qty {P3}) ÷ White Qty = % Hispanic

under-represented when compared to the census tract or Elko County. As a result, for the purpose of screening for environmental justice concerns, non-White populations in Carlin do not represent minority populations as defined by EPA's guidelines (1998).

ECONOMIC DATA

The second element of environmental justice is the potential for disproportionate impacts to populations living below the poverty level. Poverty data provided by the Census Bureau characterize only a portion of the overall population. Groups not included in the poverty data are unrelated individuals under the age of 15; individuals living in group quarters such as correctional centers, institutions, college dorms, or military barracks; or individuals in living institutions without conventional housing. Data on persons living below poverty level in and adjacent to the assessment area are presented in **Table 3-30**.

Poverty data are not available for individual census blocks. The smallest unit at which these data are available is at the block group level. This introduces ambiguity when the project specific assessment area takes in only selected blocks within a block group. If a disproportionately high percentage of an ethnic group is found to be below the poverty level, it is often difficult to determine whether that population resides within the assessment area versus some other portion of the block group.

The reviewed data indicate a disproportionately high percentage of Asian or Pacific Islanders (16%) living below the poverty level in Census Tract 9516 and Block Group 1 of that census tract. This assessment is based on a comparatively small population size. As noted previously, census blocks located in and around the Emigrant Project are not populated; they do not contain representatives of this population that is living below the poverty level. As a result, the Proposed Action would not have the potential to disproportionately impact a low-income population located elsewhere in the block group.

	White		Black		American Indian, Eskimo, or Aleut		Asian or Pacific Islander		Hispanic or Latino		Other Race or Mixed Race		Total Population*	
Location	Qty Below Poverty Level	% of Total Race	Qty Below Poverty Level	% of Total Race	Qty Below Poverty Level	% of Total Race	Qty Below Poverty Level	% of Total Race	Qty Below Poverty Level	% of Total Race	Qty Below Poverty Level	% of Total Race	Qty Below Poverty Level	% Total Population
Nevada	128,366	9%	26,047	21%	4,808	19%	8,201	9%	67,071	17%	38,263	7%	272,756	12%
Elko County	2,576	7%	0	0%	570	24%	12	4%	1,540	17%	789	16%	5,487	15%
Eureka County	147	10%	4	100%	4	24%	5	19%	24	18%	46	40%	230	13%
Carlin	140	7%	0	0%	13	28%	5	16%	15	8%	10	10%	183	8%
Tract 9516	140	7%	0	0%	13	28%	5	16%	15	8%	10	10%	183	8%
Block Group 1	42	5%	0	0%	0	0%	0	0%	6	8%	4	10%	52	6%

TABLE 3-30
Persons in Assessment Area Living Below the Poverty Level (by Race) in 1999, Compared with State of Nevada

1. U.S. Bureau of the Census 2000b. Census 2000 Summary File 3 (SF 3)-Sample Data, Detailed Tables P159A-H, Poverty Status in 1999 by Age and Race.
2. Numbers and percentages in this table were obtained from Detailed Tables P159A-H as follows for each geographic unit.
   Quantity below Poverty Level: Taken directly from "Income in 1999 below poverty level" line on each table by race.
   Percent of Total Race: (Qty below Poverty Level ÷ Total in race) = % of Total Race.
   Total Population Column: Qty below Poverty Level added across each row. % of Total Population is the quantity below poverty divided by total in that race.

CHAPTER 4

CONSEQUENCES OF PROPOSED ACTION AND NO ACTION ALTERNATIVE

INTRODUCTION

Potential direct, indirect, and cumulative impacts of the Proposed Action and No Action Alternative are described in this chapter. Construction and operation of the Emigrant Project identified in Chapter 2 would result in irreversible and irretrievable commitments of resources, residual adverse effects, and cumulative impacts to the environment. Irreversible commitments of resources are those that cannot be reversed, except over a very long period of time. Irretrievable commitments of resources are those that are lost. Residual adverse effects are those effects that remain after completion of the Proposed Action and implementation of mitigation measures. Cumulative impacts are those impacts on the environment that result from incremental impact of the action when added to other past, present and reasonably foreseeable future actions.

Potential mitigation and monitoring measures which address the Proposed Action have been identified in each resource description contained in this chapter for which a potential impact is described. Mitigation measures proposed by Newmont are summarized in Chapter 2. Impacts associated with implementation of these mitigation measures are included in the analysis of impacts described in this section. Additional mitigation and monitoring measures can be required by BLM as a condition or stipulation of approval for authorization of the Plan of Operations.

CUMULATIVE IMPACTS

Cumulative impact as stated in 40 CFR 1508.7 "...is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency [federal or non-federal] or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time..."

Results of cumulative impact analyses determine whether an action contributes significantly to impacts associated with other activities in the area, or results in significant impacts when added to other activities. Cumulative impact analyses do not consider potential mitigations for reasonably foreseeable actions.

The geographic cumulative impact area referred to in this section varies depending on the resource being discussed. **Figure 4-1** depicts the general area for most resources for which cumulative impacts have been evaluated. The Carlin Trend, an area of intense mine development, is the central feature of the cumulative impacts area. The area is generally bounded on the northwest by the Ivanhoe Mine and on the southeast by the proposed Emigrant Mine.

Cumulative impact analysis included in this section is based on an approximate 14-year operational life-of-mine for the Emigrant Project. Cumulative or additive impacts will be

described for reasonably foreseeable activities through completion of closure and reclamation, estimated to be 30 years.

PAST AND PRESENT ACTIVITIES

Wildlife habitat, mining and livestock grazing have been and continue to be dominant land use activities on private and public land in the cumulative impacts area. Ranching activities include fencing, installation of windmills, development of irrigated pasture, diversion of groundwater and surface water for irrigation, and development of springs and groundwater resources for livestock watering. Livestock grazing has been excluded from most mining areas.

Mining-related activities in the cumulative impacts area include exploration (drilling, trenching, and sampling), underground mining, open pit mining, waste rock disposal, ore milling and processing, tailing disposal, heap leaching, dewatering/discharging, and reclamation. Historic mining activity in the cumulative impacts area is discussed in Chapter 2.

New or upgraded power lines have been constructed in the cumulative impacts area to supply energy for mining activities. Access roads constructed along power line corridors facilitate inspection and construction.

REASONABLY FORESEEABLE ACTIVITIES

Reasonably foreseeable activities within the cumulative impacts area include mine development, mineral exploration, mined-land reclamation, livestock grazing, increased multi-recreational vehicle (MRV) use, and wildlife and aquatic habitat rehabilitation. These land uses are expected to continue into the future at varying levels of activity.

Mining Activities

Mining is expected to continue as a major activity in the Carlin Trend. **Figure 4-1** shows locations of existing and reasonably foreseeable mining and exploration sites in the Carlin Trend. The boundaries shown on **Figure 4-1** for the mining operations delineate areas where disturbance has occurred or is expected to occur. These boundaries represent the outer limits of major surface disturbance, but do not imply that all areas within the boundaries would be disturbed.

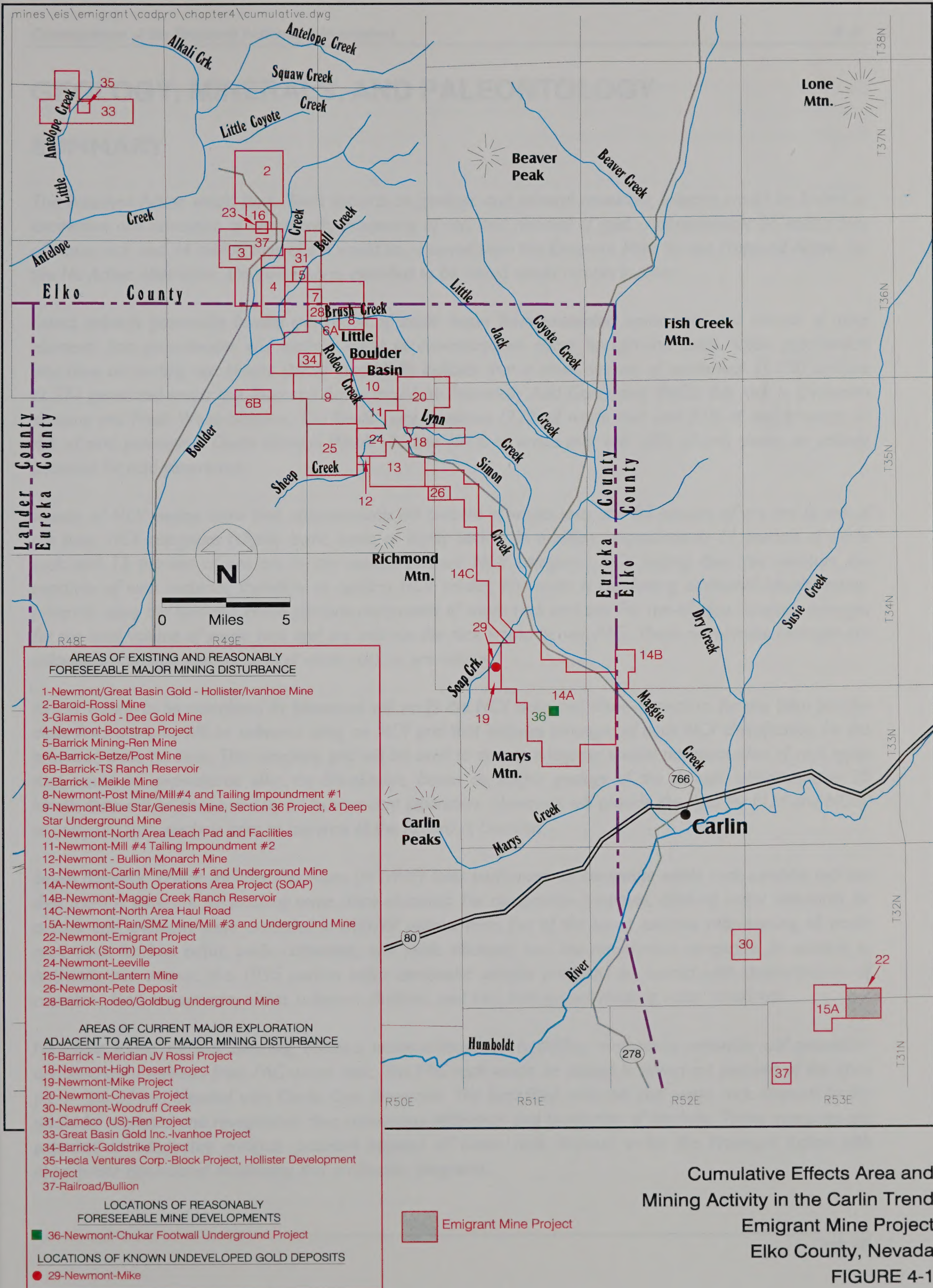
Disturbances related to mine development include mine pits, processing facilities, heap leach pads, waste rock disposal facilities, tailing impoundments, haul roads, and administrative offices. Exploration on undisturbed land is not necessarily included within boundaries shown on **Figure 4-1**.

Emigrant Mine

Ongoing exploration activities may result in identifying additional ore reserves associated with the Emigrant deposit. Discovery of additional ore reserves would increase length of operating period, water consumption, and surface disturbance.

Reclamation Activities

Reclamation of mined land throughout the Carlin Trend would rehabilitate portions of land surface and reduce impacts created by mining, including impacts to wildlife, grazing, and visual resources. Disturbed sites would blend with adjacent undisturbed areas upon establishment of vegetation. High-walls associated with open mine pits and cuts would continue to disrupt natural visual elements.



Cumulative Effects Area and
Mining Activity in the Carlin Trend
Emigrant Mine Project
Elko County, Nevada
FIGURE 4-1

GEOLOGY, MINERALS, AND PALEONTOLOGY

SUMMARY

The Proposed Action would have direct impacts on geologic and mineral resources. Impacts would be limited to excavation and relocation of waste rock, processing of ore, and removal of gold. Approximately 86 million tons of waste rock and 94 million tons of ore would be removed from the Emigrant Mine for the Proposed Action. For the No Action Alternative, the gold reserve intended to be mined would remain in-place.

Direct impacts potentially involve generation of acidic water from excavated waste rock and release of trace elements into groundwater and surface water at concentrations above background levels. Static geochemical acid-base accounting test results (NP:AP and NNP) indicate that a small amount of waste rock (1.1%) and ore (2.5%) generated under the Proposed Action would be Potentially Acid Generating (PAG); this rock is Chainman siltstone and Fresh Webb siltstone. The Devils Gate limestone (32% of waste rock and 21% of ore) presents no risk of acid generation. Oxide siliceous Webb siltstone (67% of waste rock and 76% of ore) shows an unlikely potential for acid generation.

Results of NCV testing show that approximately 88 percent of waste rock and 85 percent of ore are in one of the basic NCV categories (slightly basic, basic, or highly basic). In addition, approximately 11 percent of waste rock and 12 percent of ore are in the neutral or inert NCV category. NCV testing does not measure the reactivity of rock material; therefore to confirm NCV results, Newmont is conducting additional kinetic testing, primarily using the oxidized Webb siltstone component of waste rock and ore. For run-of-mine samples, averages for the total volume of waste rock and ore indicate the rock would be non-PAG. These run-of-mine averages are calculated based on percent of total waste rock or ore volume.

Kinetic testing to be completed by Newmont will verify the NCV data and allow corrections for any false positive data. Rock samples will be collected using an NCV grid that includes tonnages of each NCV classification for the proposed mine pit area. This sampling grid will be used to ensure adequate spatial representation of rock types that would be encountered over the life-of-mine. Based on simple geology of the deposit, approximately 20 kinetic tests will be performed by an independent laboratory. Newmont will provide the data for BLM and NDEP to complete their analysis prior to issuance of the Record of Decision.

Seven Meteoric Water Mobility Procedure (MWMP) tests performed on composite waste rock samples indicate that there is potential for leaching some trace elements. For comparison purposes, drinking water standards for arsenic and antimony were exceeded in MWMP extract from five of the seven samples representing all waste rock types (carbon sulfur, oxide carbonate, and oxide siliceous) and the run-of-mine composite. In addition to antimony and arsenic, the 1995 carbon sulfur composite sample produced an extract with concentrations of cadmium, lead, manganese, nickel, selenium, thallium, and zinc that exceed drinking water standards.

Newmont would use rock blending, isolation, encapsulation, and backfilling methods to minimize acid generation and leachate migration from PAG waste rock. The PAG rock would be placed in mined-out portions of the open pit on top of and blended with Devils Gate limestone. The backfilled mine pit and waste rock disposal facility would be regraded and revegetated, thus minimizing infiltration and production of leachate. These measures are expected to adequately mitigate potential impacts of waste rock disposal under the Proposed Action with appropriate operational monitoring and verification programs.

Earthquakes with characteristics determined for the Project Area (i.e., maximum acceleration of 0.4 g, with a recurrence interval of about 1,000 years) represent limited risk to the stability of proposed waste rock and heap leach facilities at the Emigrant Mine.

Physical disturbance associated with the Emigrant Project could result in limited impacts to paleontological resources. If vertebrate fossils are discovered during mine development or operational activities, Newmont would cease mining in the vicinity of the fossil discovery, and contact BLM to determine steps necessary to evaluate the discovery. Impacts would be limited to areas of land disturbance.

DIRECT AND INDIRECT IMPACTS

PROPOSED ACTION

Call and Nicholas (1986) in a study of seismic activity of the Rain Mine area (2.5 miles west of Emigrant Mine area) for facility design and siting studies predicted a maxim acceleration of 0.4 g, with a recurrence interval of about 1,000 years. Earthquakes with these characteristics represent limited risk to the stability of proposed waste rock and heap leach facilities at the proposed Emigrant Project where reclaimed slopes are at an angle of 2.5H:1.0V. Acceptable levels of risk for heap leach and waste rock disposal facilities are determined by regulatory agencies and are usually based on consequences envisioned from potential failure of the facility. As described in the *Geology, Minerals, and Paleontology* section of Chapter 3, Valera Consultants (2004) calculated the probability of earthquakes occurring that have magnitudes causing potential damage to the proposed heap leach facility at Emigrant Project are on the order of three percent for the 14-year operational mine life (475-year return period) and two percent for the 200-year closure period (2,475-year return period). The conservative nature of seismic calculations by Valera Consultants (2004), and the limited consequences of a potential failure, likely are acceptable seismic risks for the proposed Emigrant facilities.

The UBC standards, based on the nature of foundation materials, and USGS earthquake record data were used by Valera Consultants (2004) to assess seismic risk of the heap leach facility. Valera Consultants (2004) assessed earthquakes with a return-period of 475 years (appropriate for a 14-year operational mine life) and 2,475 years (appropriate for a 200-year period including post-closure). The maximum credible earthquake used for the evaluation was a magnitude 6.1 occurring at distances ranging from 10 to 17 miles from the site. These earthquakes have potential to produce strong ground shaking; therefore design of the heap leach facility addressed these conditions to prevent damage to the facility from material slumping on the 2.5H:1.0V design slopes.

Approximately 86 million tons of waste rock and 94 million tons of ore would be removed from the Emigrant Project under the Proposed Action. The Emigrant ore deposit is shallow and would be mined above the water table. Acid-base accounting tests and calculations for 1,272 rock samples throughout the proposed mine pit area indicate the majority of waste rock and ore is anticipated to be oxidized and, therefore, not expected to generate acid upon exposure to atmospheric conditions.

The *Acid Rock Drainage Policy for Activities Authorized under 43 CFR 3802/3809* (BLM 1996) states that rock is Potentially Acid Generating (PAG) if NP:AP ≤1.0 and NNP ≤20 tons $CaCO_3$ per kiloton (tons/kton) rock material. Rock is not considered PAG if NP:AP ≥3.0 and NNP ≥20 tons/kton. For samples having NP:AP

between 1.0 and 3.0, or NNP between -20 and +20 tons/kton, the rock has unlikely potential to generate acid. Based on this guidance, the carbon sulfur rock types (Chainman and Fresh Webb siltstone; 1.1% of waste rock and 2.5% of ore) would be PAG. Devils Gate limestone (32% of waste rock and 21% of ore) would not be acid generating, and oxide siliceous Webb siltstone (67% of waste rock and 76% of ore) shows an unlikely potential to generate acid (NP:AP = 6 for both waste rock and ore; average NNP = 3 tons/kton for both waste rock and ore). See *Geology, Minerals, and Paleontology* section in Chapter 3 and **Table 3-2** for more information regarding these test results).

Run-of-mine averages calculated for waste rock and ore, based on percentage of each lithology relative to total rock volume and assuming complete mixing, indicate that both waste rock and ore would be non-PAG (average NP:AP = 71 for waste rock and 86 for ore; average NNP = 146 tons/kton for waste rock and 69 tons/kton for ore) (**Table 3-2**). These run-of-mine averages are calculated based on percent of total waste rock and ore volume.

In addition to using NP:AP and NNP values based on BLM (1996) guidance, Newmont considered NCV data for evaluation of potential for rock to generate acid using criteria obtained from the document, "*Newmont Standard Waste Rock Evaluation Methods – Protocol for NCV Classification Studies*". These criteria were developed to address samples having little or no acidification and neutralization potential. Such samples can have NP:AP and NNP values that suggest unlikely acid generation potential, as well as having an absence of acid-generating sulfide minerals.

Results of NCV analyses (**Table 3-2**) show that the Devils Gate limestone is highly basic, Chainman and Fresh Webb siltstone are slightly acidic to acidic, and oxide Webb siltstone is slightly basic. Approximately 88 percent of waste rock and 85 percent of ore are in one of the basic NCV categories (slightly basic, basic, or highly basic). In addition, approximately 11 percent of waste rock and 12 percent of ore are in the neutral or inert NCV category. Many of the Webb siltstone samples have low levels of sulfide and carbon fractions (**Table 3-2**). The NCV method for classifying acidification potential of rock samples was developed by Newmont to address such samples.

NCV testing does not measure the reactivity of the rock material. Therefore, to confirm NCV results, Newmont will submit samples for additional kinetic tests, primarily using the oxidized Webb siltstone component of waste rock and ore. Kinetic testing will verify the NCV data and allow corrections for any false positive data. Rock samples will be collected using an NCV grid that includes tonnages of each NCV classification for the proposed mine pit area. This sampling grid will be used to ensure adequate spatial representation of rock types that would be encountered over the life-of-mine. Based on geology of the deposit, approximately 20 kinetic tests will be performed by an independent laboratory. Newmont will provide the data for BLM and NDEP to complete their analysis prior to issuance of the Record of Decision.

The Chainman and/or Fresh Webb siltstone, which account together for approximately 1 million tons or 1.1 percent of waste rock, and 2.4 million tons or 2.5 percent of ore, would be encountered during the third, seventh, and eighth years of mining (**Table 4-1**). This PAG waste rock would be blended with and encapsulated by neutralizing oxide waste rock and Devils Gate limestone and placed as backfill into mined-out portions of the Emigrant Mine pit. Thirty-two percent of waste rock, including large portions of the pit floor, would be comprised of neutralizing Devils Gate limestone (Newmont 2004a). Handling PAG waste rock in this manner would limit exposure to oxygen and meteoric water, thereby reducing potential

TABLE 4-1
Proposed Waste Rock Mining Sequence
Emigrant Project

Year	1	2	3	4	5	6	7	8	9	10	Total
Rock Type	**Million Tons**										
Devils Gate Limestone	0.9	1.8	3.6	2.1	3.1	3.7	2.6	4.0	3.2	1.5	26.5
Webb Siltstone (oxide siliceous)	4.1	6.0	4.3	9.2	7.3	5.7	8.1	6.0	4.2	2.4	57.3
Chainman Siltstone	0	0	0.2	0	0	0	0	0	0	0	0.2
Fresh Webb Siltstone	0	0	0	0	0	0	0.07	2.8	0	0	2.9
Tonka Conglomerate	0	0	0	0	0	0	0.1	0	0	0	0.1
Total	**5.0**	**7.8**	**8.1**	**11.3**	**9.4**	**9.4**	**10.9**	**12.8**	**7.4**	**3.9**	**87.0**

Source: Newmont 2004b

for acid generation from the Chainman and Fresh Webb siltstone lithologies. Any acidic leachate generated would be neutralized by surrounding oxide waste rock and Devils Gate limestone.

Minimal, if any, amounts of ore are anticipated to remain exposed in pit walls. Any acidity produced by ore on the leach pad would be neutralized by the leaching solution which is maintained at basic pH values. For these reasons, it is unlikely that acid generation would occur from ore.

Potential for release of trace elements from the three operational waste rock types was assessed using MWMP data collected from seven composite samples (**Table 3-3**). For comparison purposes, federal and state drinking water standards for arsenic and antimony were exceeded in MWMP extract from five samples that represent all waste rock types (carbon sulfur, oxide carbonate, and oxide siliceous) and a run-of-mine composite. Arsenic and antimony can be mobile under alkaline conditions; however, migration of these compounds can be limited due to sorption by clays, hydroxides, and organic matter. Concentrations of other metals in six of the seven waste rock samples were low and often below the laboratory detection limits. One carbon sulfur composite sample tested in 1995 produced an extract with concentrations of cadmium, lead, manganese, nickel, selenium, thallium, and zinc that also exceed drinking water standards. Each MWMP sample produced leachate with pH values ranging from 6.4 to 8.2 standard units.

The waste rock disposal facility would be reclaimed by recontouring to eliminate flat portions, placement of topsoil to an average depth of 1.0 foot, and broadcast application of an approved seed mixture. Newmont proposes to operate the heap leach pad as a zero-discharge facility. Upon cessation of mine operations, the heap would be regraded with an appropriate thickness of growth media to form an evapotranspiration cover. Process ponds would be backfilled with growth media to form lined evapotranspiration cells to which residual drain-down solution would be applied.

PALEONTOLOGICAL RESOURCES

No known fossil quarries or vertebrate fossils are located in the area to be physically

disturbed by the proposed Emigrant Mine. Impacts on any fossils that may exist in the proposed disturbed area would usually be direct, caused by physical disturbance.

NO ACTION ALTERNATIVE

The No Action Alternative would avoid potential direct and indirect impacts of the Proposed Action. It would also eliminate recovery of approximately 94 million tons of ore from the geologic resource.

CUMULATIVE EFFECTS

Cumulative environmental geochemical impacts from the Proposed Action would be limited to potential increased loading of metals and other dissolved solids to water resources. Because gold mining is a major activity in the Carlin Trend, it is reasonable to assume that large-scale mining will continue, resulting in the creation of open pits, underground mines, waste rock disposal facilities, and heap leach pads.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Gold would be removed from the geologic resource at the Emigrant Mine if the Proposed Action is implemented. This action would constitute an irreversible commitment of the geologic resource resulting from removal of gold in the ore deposit.

POTENTIAL MONITORING AND MITIGATION MEASURES

MONITORING

Waste rock characterization data required for the Water Pollution Control Permit would be provided to BLM and NDEP. In addition, an annual waste rock management report that summarizes mining activity would be submitted to BLM and NDEP.

MITIGATION

No mitigation measures beyond those included in the Proposed Action have been identified by BLM.

RESIDUAL ADVERSE EFFECTS

No residual adverse effects to the geologic resource would be expected from the Proposed Action and mitigation measures.

AIR QUALITY

SUMMARY

Mining-related activities at the Emigrant Project (Proposed Action) would be a source of particulate and gaseous air pollutants. Fugitive dust emissions would be generated by mining, processing, hauling, storing ore, and disposal of waste rock. Particulate emissions would be mitigated by minimization of drop heights during loading, dust suppression and procedures outlined in the Handbook of Best Management Practices (Nevada State Conservation Commission 1994). Gaseous pollutant emissions would result from blasting, construction and mining equipment, and vehicle exhaust. These emissions would be minimized by proper equipment maintenance and operation. Newmont would seek any required air quality construction and operating permits from the

Nevada Division of Environmental Protection (NDEP), Bureau of Air Quality. Air quality in the vicinity of the Emigrant Project would continue to be better than National Ambient Air Quality Standards. Emigrant Project emissions would not affect air quality or visibility in any Class I areas.

DIRECT AND INDIRECT IMPACTS

PROPOSED ACTION

Gaseous and particulate air contaminant emissions would be generated during construction and continue throughout the mining period. Particulate emissions from construction and mining would be caused by drilling, blasting, excavating, loading, hauling, and dumping of waste rock and ore. Particulate emissions will be limited by the implementation of Best Management Practices, including minimizing drop heights during loading, and watering and chemical stabilization of haul roads. Diesel engine exhaust from construction equipment, mining equipment, and various transportation vehicles would generate gaseous air pollutants.

Mining would occur in an open pit with fugitive dust emissions controlled at the point of generation. Ore and waste rock would be drilled and blasted in sequential benches to facilitate loading and hauling. Blasted ore and waste rock would be loaded into off-road, end-dump haul trucks using shovels and front-end loaders. Benches would be established at approximately 20-foot intervals with bench widths varying to include safety berms and haul roads. Haul trucks would move within the open pit using roads on the surface of benches with ramps extending between two or more benches. Once the haul trucks leave the pit, they would travel on main haul roads to the waste rock disposal facility, pit backfill areas, or heap leach facility.

Fugitive dust emissions would be generated from wind erosion of disturbed areas and road dust. All haul roads would be maintained on a continuous basis for safe and efficient haulage and to minimize fugitive dust emissions. Generation of fugitive dust from ore handling activities would be controlled using Best Management Practices (Nevada State Conservation Commission 1994) which could include direct water application, use of approved chemical binders or wetting agents, water spray, and revegetation of disturbed areas concurrent with operations.

The Emigrant Project would be a source of gaseous air pollutants including sulfur dioxide (SO_2), carbon monoxide (CO), oxides of nitrogen (NOx), and volatile organic compounds (VOCs). The primary source of these emissions would be exhaust from diesel engines used to power construction equipment, mining machines, and haul trucks. Gaseous emissions from diesel engines would be minimized through proper operation and maintenance.

Another source of gaseous pollutants from the proposed Emigrant Project would be ammonium nitrate and fuel oil (ANFO) used as blasting agents. The use of ANFO can cause fugitive emissions of NOx, CO, and SO_2.

Ore from the Emigrant Project would be processed by run-of-mine oxide heap leach techniques. Loaded carbon (carbon containing metal) resulting from the leaching process would be transported to Newmont's South Operations Area processing facility. Carbon handling and refinery services at the South Operations Area facility create mercury emissions. Mercury emissions are controlled by approved pollution control devices. Diesel and gas combustion sources also emit mercury.

Maximum potential hourly emissions would not increase due to processing of loaded carbon columns at the South Operations Area. Carbon columns from the Emigrant Project would offset production from existing sources with no projected increases in total annual mercury emissions from the South Operations Area.

NO ACTION ALTERNATIVE

The No Action Alternative would avoid potential direct and indirect impacts of the Proposed Action to air resources. Previously approved actions would continue.

CUMULATIVE EFFECTS

Fugitive dust and gaseous emissions from nearby mine operations affect air quality in the region (i.e., Carlin Trend). The Emigrant Project would create continued and extended haul truck traffic. Ambient air quality data for the region currently reflect impacts of existing mining operations in the air-shed. Air quality in the region meets applicable standards and would be expected to remain in compliance with addition of Emigrant operations.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

No irreversible or irretrievable commitment of air resources would result from the Proposed Action or Alternative.

POTENTIAL MONITORING AND MITIGATION MEASURES

MITIGATION

Roads would be watered and treated as necessary to limit fugitive dust.

RESIDUAL ADVERSE EFFECTS

No residual adverse effects on air resources would be anticipated as a result of the Proposed Action and mitigation measures. After cessation of mining and completion of reclamation activities, air quality would be expected to reach pre-mining conditions.

WATER QUANTITY AND QUALITY

SUMMARY

The Proposed Action would have direct impacts on some water resources in the Project Area. Impacts to surface water would be associated primarily with diversion and replacement of a natural intermittent stream channel with an engineered diversion channel through the operational and reclaimed mine pit area. Areas to be disturbed by mine-related activities (e.g., roads, mine pit, waste rock disposal area, and heap leach facility) would result in increased erosion and sedimentation until reclaimed vegetation has been sufficiently established. Best Management Practices would be implemented for disturbed areas to prevent or minimize sediment movement to off-site areas. A monitoring program would be implemented to verify on-site control of erosion and sedimentation. If on-site increases in sediment load to surface water did occur from the Emigrant Project, these increases would extend to Dixie Creek and possibly South Fork Humboldt River.

Short-term impacts to groundwater levels would result due to removal of water by production wells in the central part of Dixie Creek Valley. These wells would transport water from the valley bottom to the proposed mine facilities located farther upland on the west side of Dixie Creek Valley This groundwater pumping, however, has

been occurring since 1988 for the nearby Rain Mine. Groundwater withdrawal from the production wells for the first five years of the proposed Emigrant Project (135 to 140 million gallons per year) would be similar to full water production for the Rain Mine (138 million gallons per year peak production). After year 5, average water use for the Emigrant Project would be about 130 million gallons per year.

Another potential impact could involve release of trace elements into groundwater or surface water at concentrations above water quality standards from the backfilled mine pit and/or waste rock disposal facility. Acid-base account tests of these rock types indicate that a small percentage of waste rock (1.1%) and ore (2.5%), all of which is the carbon sulfur type (Chainman and Fresh Webb siltstone), would be potentially acid generating (PAG). Approximately 67 percent of waste rock and 76 percent of ore (Webb siltstone) show an unlikely potential to generate acid. The remaining amount of waste rock (32%) and ore (21%), as Devils Gate limestone, presents no risk of acid generation.

Results of Net Carbonate Value (NCV) analyses show that Devils Gate limestone is highly basic, Chainman and Fresh Webb siltstone are slightly acidic to acidic, and oxide Webb siltstone is slightly basic. Approximately 88 percent of waste rock and 85 percent of ore are in a basic NCV category (slightly basic, basic, or highly basic). Approximately 11 percent of waste rock and 12 percent of ore are in the neutral or inert NCV category.

Meteoric Water Mobility Procedure (MWMP) tests indicate that waste rock has potential to leach some trace elements in concentrations exceeding drinking water quality standards (antimony, arsenic, cadmium, lead, manganese, nickel, selenium, thallium, and zinc). With the exception of arsenic and antimony, these exceedances of water quality standards occurred in a single carbon sulfur composite sample analyzed in 1995. Carbon sulfur rock (Chainman and Fresh Webb siltstone) would be managed as PAG waste.

Newmont proposes to use rock blending, isolation, encapsulation, and backfilling methods to minimize acid generation and leachate migration from waste rock that is potentially acid-generating. The heap leach facility would be designed to collect drain-down water in a lined pond, which would eventually be filled with soil and vegetated to evapotranspirate all water in the long-term. The backfilled mine pit, waste rock disposal facility, and heap leach facility would be graded and vegetated, thereby minimizing meteoric water infiltration and production of leachate. These measures are expected to adequately mitigate potential impacts of waste rock and leach rock disposal under the Proposed Action, along with appropriate operational monitoring and verification programs.

The No Action Alternative would result in maintenance of natural stream channels in the Project Area, elimination of additional make-up water pumping from wells in Dixie Creek Valley, and prevent potential quality impacts to groundwater and surface water from the mine pit and waste rock disposal area.

DIRECT AND INDIRECT IMPACTS

PROPOSED ACTION

Sediment

Potential direct and indirect impacts to water resources from the proposed Emigrant Project would include erosion and sedimentation to drainages in the vicinity of disturbed areas until vegetation is sufficiently established during reclamation. Primary disturbance areas include the backfilled mine pit, waste rock disposal area, heap leach facility, and roads. These facilities are located in two tributary drainages that extend eastward from the Piñon Range, through the northern and southern portions of the Project Area, and eventually to Dixie Creek located approximately five miles east of the Emigrant Project Area. Dixie Creek flows into

the South Fork Humboldt River approximately eight miles northeast of the Project Area. Since these tributary channels are ephemeral downstream of the Project Area, potential increases in sediment load to surface water would occur during snowmelt and major rain events. The natural sediment load in surface water in this area, however, already is high during these high flow events (also see *Soil Resources* section in Chapters 3 and 4 for discussion of erosion).

A stormwater permit would be obtained by Newmont for the Emigrant Project that would specify measures to reduce and control runoff and sediment from disturbed areas. If increased sediment load did move downstream from the Project Area to Dixie Creek, the riparian habitat improvement areas and beaver dams along lower Dixie Creek would help trap sediment and prevent or reduce sediment load to South Fork Humboldt River from this area.

Diversion Channel

A permanent surface water diversion channel, 3,000 feet in length, would be constructed through the operational and reclaimed mine pit area. Because most of this channel would be constructed through bedrock, increased sedimentation to the affected drainage channel below the Project Area is not expected from the channel. The diversion channel would be designed to transmit the 500-year, 24 hour storm event. Runoff from some disturbed mine pit areas would enter the diversion channel, with increased sediment load during periods of major storm events. Retention of sediment in portions of the diversion channel, however, would be a benefit to possible establishment of riparian areas. Reduced aquatic vegetation may increase slightly the temperature of surface water within and downstream of the diversion channel.

Sediment catchment basins would be constructed in the Emigrant Project Area, with a minimum of one upstream and one downstream of the diversion channel, one downgradient of the waste rock disposal facility, and one downstream of the heap leach facility. These basins would collect sediment transported in surface water above and through the diversion channel. The diversion channel through the mine pit area would be constructed almost entirely in Devils Gate limestone and, therefore, would not adversely affect water quality.

Production Wells

Short-term impacts to groundwater levels would result due to removal of water by two production wells (RPW-1 and RPW-2) in the central Dixie Creek Valley. These wells would transport water from the valley bottom for consumptive use in the proposed mine area located farther upland on the west side of Dixie Creek Valley. The production wells are completed into 700 to 860 feet of unconsolidated valley-fill deposits of clay, sand, and gravel. The two production wells were pumped at combined rates of about 120 to 130 million gallons per year from 1988 to 1995 for Newmont's nearby Rain Mine.

Water use at the Rain Mine will continue for about another five years at an expected rate of 5 to 10 million gallons per year, which has been the pumping volume for the Rain Mine since 1995 (Newmont 2004d). The proposed volume to be pumped from the Dixie Creek Valley production wells for the Emigrant Project would total about 130 million gallons per year for the 14-year operational mine life. The combined pumping volumes for the Emigrant Mine and Rain Mine for the initial 5-year period (135 to 140 million gallons per year), therefore, would be approximately equivalent to the peak pumping rate of 138 million gallons per year that occurred for the Rain Mine in 1991 (Newmont 2004f). Lower pumping rates would occur at the Emigrant Project for reclamation activities.

No adverse impacts are expected to surface water flow in Dixie Creek and groundwater levels in the valley bottom from proposed pumping for the Emigrant Project. Studies by Newmont (2004f) have shown that groundwater withdrawals since 1988 from the Dixie Creek Valley production wells for the Rain Mine has not impacted flows in Dixie Creek. Depth to groundwater measured in the production wells and nearby piezometers shows that water levels decline a few feet seasonally due to production pumping, with recovery typically occurring during wetter periods and during times of reduced pumping from the production wells (Newmont 2004f). One of the piezometers (DFP-8) located midway between the production wells and Dixie Creek has shown no response to increased pumping rates as shown by piezometers near the production wells. Portions of Dixie Creek appear to be in connection with groundwater and are perennial; however, the overall creek is intermittent and flows mainly in response to springs and seasonal snowmelt and major rain events (**Figure 3-5**).

Groundwater Quantity

The Emigrant Project ore body is shallow and would be mined above the groundwater table in bedrock. As described in the *Water Quantity and Quality* section of Chapter 3, groundwater was encountered in the Chainman siltstone at a depth of about 100 feet in a piezometer completed west of the Emigrant Spring fault (west of proposed mine pit area). On the east side of the fault (in the proposed mine pit area), a piezometer did not intercept groundwater to its total depth of 360 feet in the Webb siltstone. This indicates that there are fault blocks in the Emigrant Project Area that isolate zones of groundwater. Ultimate depths of the proposed mine pit (300 feet below ground surface) would not intercept any of this bedrock groundwater east of the Emigrant Spring fault. The mine pit would not extend west of the fault and, therefore, not intercept bedrock groundwater in that area.

Shallow perched groundwater was encountered in some exploration drill-holes in alluvium overlying sedimentary bedrock at depths of less than 15 feet (Simons & Associates 1997). Shallow alluvial deposits of interbedded sand and gravel in the drainage bottoms are up to 50 feet thick. This alluvial material would be removed by the proposed Emigrant Project pit. Therefore, some groundwater (approximately 5 gpm in each of two tributary channels) would flow from alluvium into the west side of the open and backfilled mine pit. It is assumed there is little or no groundwater in alluvium along the channels immediately downstream of the proposed mine pit due to lack of surface water in this area most of the year.

Discharge from several small springs and seeps west of the Project Area, including Emigrant Spring, would not be influenced by the Emigrant Project because the springs are located upgradient and at elevations higher than the mine facilities. Additionally, the proposed mine pit would not intercept groundwater in bedrock which is the source of water to the springs.

Water Quality

Based on acid-base account tests (NP:AP and NNP; see *Geology, Minerals, and Paleontology* section in this chapter), the carbon sulfur waste rock types (Chainman and Fresh Webb siltstone; 1.1% of waste rock and 2.5% of ore) would be potentially acid generating (PAG). Devils Gate limestone (32% of waste rock and 21% of ore) would not be acid generating, and oxide siliceous Webb siltstone (67% of waste rock and 76% of ore) shows an unlikely potential to generate acid. In addition, the Webb siltstone shows low levels of carbon and sulfur fractions (**Table 3-2**). Run-of-mine averages calculated for waste rock and ore, based on percentage of each lithology relative to total rock volume and assuming complete

mixing, indicate that both waste rock and ore would be non-PAG.

Newmont used criteria for NCV data to address samples having little or no acidification and neutralization potential. Such samples can have NP:AP and NNP values that suggest unlikely acid generation potential, as well as having an absence of acid-generating sulfide minerals. Results of the NCV analyses show that Devils Gate limestone is highly basic, Chainman and Fresh Webb siltstone are slightly acidic to acidic, and oxide Webb siltstone is slightly basic. Approximately 88 percent of waste rock and 85 percent of ore are in one of the basic NCV categories (slightly basic, basic, or highly basic). In addition, approximately 11 percent of waste rock and 12 percent of ore are in the neutral or inert NCV category.

PAG waste rock would be blended with and encapsulated by neutralizing oxide siliceous Webb siltstone and Devils Gate limestone and placed as backfill into mined-out portions of the Emigrant Project pit. Thirty-two percent of waste rock, including large portions of the pit floor, would be comprised of neutralizing Devils Gate limestone (Newmont 2004a). Handling PAG waste rock in this manner would limit exposure to oxygen and meteoric water, thereby reducing potential for acid generation from the Chainman and Fresh Webb siltstone lithologies. Any acidic leachate generated would be neutralized by surrounding oxide waste rock and Devils Gate limestone.

Potential for release of metals from waste rock was assessed using MWMP data collected from seven composite samples (see **Table 3-3**). Five of the samples representing all waste rock types (carbon sulfur, oxide carbonate, oxide siliceous, and run-of-mine) indicate that leachate from waste rock may exceed drinking water standards for antimony and arsenic. MWMP extract from the 1995 carbon sulfur waste rock sample (i.e., Chainman, Fresh Webb siltstones) also exceeded standards for cadmium, lead, manganese, selenium, thallium, and zinc. This rock type, identified as PAG from NP:AP and NNP values, would account for 1.1 percent of total waste rock volume. The carbon sulfur waste rock would be encapsulated by oxide rock and limestone in the mine pit as described above. Grading and revegetation of final waste rock placement areas would minimize infiltration of meteoric water.

Arsenic and antimony can be mobile under alkaline conditions; however, migration of these compounds can be limited due to sorption by clays, hydroxides, and organic matter. Concentrations of arsenic from the MWMP tests (<0.04 to 0.114 mg/L with mean of 0.05 mg/L; **Table 3-3**) are similar to background concentrations of arsenic measured at Emigrant Spring (<0.02 to 0.06 mg/L with mean of 0.02 mg/L; **Table 3-14**). Concentrations of antimony measured at Emigrant Spring are all below the detection limit of 0.002 mg/L (**Table 3-14**). Increased concentrations of arsenic and/or antimony in groundwater beneath the proposed mine pit and waste rock disposal facility are not expected because of: attenuation capacity, depth to groundwater of >360 feet in the proposed mine pit area, and reclamation that would minimize infiltration of meteoric water. This will be confirmed by groundwater monitoring downgradient of these facilities.

The heap leach facility and collection ponds would be lined and therefore, no drain-down water would be expected to move through the liner systems. Atomizers would be used in ponds to increase evaporation of water for about seven years after cessation of processing. At that time, one or more of the lined ponds would be filled with growth media and vegetated such that natural evapotranspiration would remove residual drain-down water flowing to the "treatment cell" (see **Figure 2-10**). Drain-down rate of water infiltrating through the reclaimed heap leach facility would decline to about 20 gpm five to seven years after cessation of processing (Telesto Solutions

Inc. 2004, 2005). The final reclaimed surface of the heap leach facility would temporarily store most excess infiltrated meteoric water in the growth media during periods of precipitation, and then release the water by evapotranspiration.

Where needed, diversion ditches would be constructed around the mine pit, waste rock disposal and heap leach facilities, and other ancillary facilities to prevent undisturbed area surface water runoff from entering disturbed areas. These diversion ditches would be designed to convey runoff from the 100-year/24-hour storm event, except for the primary diversion channel through the reclaimed mine pit which would be designed to transmit the 500-year/24-hour storm event. After cessation of mining, the mine-related facilities would be contoured to promote runoff and prevent water ponding. The waste rock disposal and heap leach facilities, and backfilled mine pit would be subject to placement of growth media and vegetated to enhance evapotranspiration so that minimal precipitation would infiltrate into the rock. This type of store-and-release cover is effective in reducing infiltration rates, especially in climatic conditions characteristic of the Emigrant Project Area.

NO ACTION ALTERNATIVE

The No Action Alternative would avoid potential direct and indirect impacts of the Proposed Action to water resources. Some groundwater pumping from production wells in Dixie Creek Valley likely would continue for about five years at the nearby Rain Mine at rates of 5 to 10 million gallons per year.

CUMULATIVE EFFECTS

Existing range conditions and grazing practices would act cumulatively with the Proposed Action to increase water temperature and sediment delivery to the Dixie Creek tributary channels that extend through the Emigrant Project Area. The amount of sediment contribution from the Emigrant Project Area would depend on best management practices that would be used to control erosion and sedimentation. During periods of surface runoff, grazed and burned areas contribute sediment to tributary drainages to Dixie Creek and South Fork Humboldt River.

Cumulative effects of groundwater withdrawal in the Dixie Creek Valley for the Rain Mine and Emigrant Project would remain for a period of about five years. The combined pumping volumes for both mines for the five-year period, however, would be similar to maximum pumping volume that occurred for the Rain Mine during 1988-1994.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

No irreversible or irretrievable commitment of water resources would result from the Proposed Action or Alternative.

POTENTIAL MONITORING AND MITIGATION MEASURES

MONITORING

- Water quality monitoring plan (BLM, NDEP, Newmont) with contingency provisions;
- Monitor groundwater quality in the vicinity of the mine pit, waste rock disposal facility, and heap leach facility for constituents of concern;
- Monitor surface water flow and quality in drainage channels in the vicinity of the Project Area, including Dixie Creek and possibly South Fork Humboldt River; and

- Monitor depth to groundwater in production wells and piezometers located in Dixie Creek Valley.

MITIGATION

- See *Wetland/Riparian Areas* section in this chapter (reconstruct/maintain Emigrant enclosure; fence wetlands and riparian areas; natural design for stream channel diversion).

RESIDUAL ADVERSE EFFECTS

There would be no residual adverse effects to water resources associated with the Emigrant Project. No impacts from implementation of mitigation measures are expected for this Project.

SOIL RESOURCES

SUMMARY

The proposed Emigrant Project would result in approximately 1,463 acres of surface disturbance including the mine pit area, haul roads, waste rock disposal facility, heap leach pad, process ponds, borrow areas, and access roads. Potential impacts to soil resources include loss of soil during salvage and replacement, soil loss in stockpiles due to wind and water erosion, and reduced biological activity and soil structure. These impacts would be reduced by direct hauling stripped growth media from active mine pits for placement over backfilled portions of previously mined areas. Newmont would initiate reclamation activities concurrent with ongoing mining operations. As mining operations progress, backfilled portions of the pit would be concurrently regraded, topsoiled, and seeded.

The last mine pit panel would not be backfilled and would remain with exposed rock faces at the end of mining. Interruption of soil processes and functions during operation of the proposed mine Project would be reversed by returning soil to disturbed areas through reclamation and allowing natural soil development to become reinstated.

Implementation of the No Action Alternative would eliminate predicted impacts to soil resources identified for the Proposed Action.

DIRECT AND INDIRECT IMPACTS

The National Soil Survey Handbook (1993), Table 620-11, Soil Reconstruction Material for Drastically Disturbed Areas, rates suitability of soil based on properties that influence erosion and stability of the surface, and productive potential of reconstructed soil. A number of restrictive properties are evaluated in descending order of importance. Reconstruction of soil in drastically disturbed areas involves replacing layers of soil material or unconsolidated geologic material, or both, in a vertical sequence of such quality and thickness that a favorable plant growth medium results.

Potential impacts to soil resources would occur during soil salvage operations and soil redistribution activities. Impacts to soil during salvage and stockpiling operations include

physical loss of soil from excavating and handling the soil and interruption of soil biological, physical, and chemical activity as a result of placement of soil in stockpiles. Additional soil loss occurs during reclamation when soil is rehandled from stockpiles and distributed on regraded areas.

PROPOSED ACTION

Direct impacts to soil resources resulting from implementation of the Proposed Action include modification of the soil chemical, biological, and physical characteristics as well as direct loss of soil from handling and stockpiling. These impacts would be reduced through direct hauling stripped growth media from active mine pits for placement over backfilled portions of previously mined pit areas where possible. Such efforts would reduce the duration of time that soil is exposed in stockpiles to erosional elements. Direct haulage and placement of stripped topsoil would also reduce the losses of biological activity and chemical changes in the growth media.

Areas where direct haul and placement of topsoil is not feasible (e.g., borrow areas, ancillary facilities, heap leach pad), growth media would remain in stockpiles over the duration of mining activity. Stockpiled soil would be subject to wind and water erosion resulting in greater loss over the life of the mine. Stockpiled soil would also exhibit decreased biological activity and altered physical and chemical characteristics.

The primary mechanism for direct soil loss is wind erosion. Wind erosion hazard increases when soil is stockpiled, because the surface soil which contains more organic matter (which reduces wind erosion susceptibility) is mixed with subsoil and substratum which contain less organic matter, soil aggregates are destroyed, biological soil crusts are buried, and vegetative cover and litter is removed.

Water erosion potential on disturbed soil could occur during periods of heavy precipitation due to exposed soil, steep slopes, lack of biological soil crusts, and low organic matter content. Under the Proposed Action, Best Management Practices (BMPs) would be implemented to control soil loss including: run-on/run-off control berms, installation of settling ponds, mulching, interim seeding, leaving selected slopes in a roughened condition, and maintenance of sediment control systems. Soil would be removed from the run-off control ditch system and settling ponds as needed to maintain capacity. Soil removed from ditches and ponds would subsequently be used in reclamation.

Potential soil transport from disturbed mine areas attributable to storm water were estimated using the Water Erosion Prediction Project (WEPP) model (USDA 2002). Soil transport from the drainage basin of the unnamed tributary transecting the proposed pit area was modeled for pre-mine, an early phase of operational mining, and post reclamation conditions. Mine components that were addressed in the model include the soil stockpiles, haul roads, waste rock disposal facility, and the leach pad site. Model results (**Appendix E**) indicate that the estimated annual sediment yield transported to the drainage channel under expected site conditions would range from 0.103 to 0.73 ton per acre (Maxim 2005). Sediment collection basins, a diversion channel, and stream bank stabilization work would be implemented to capture sediment from the disturbed areas.

Chemical changes would result from mixing surface soil horizons with subsoil during salvage and stockpiling of soil from the site. Mixing soil horizons during salvage and stockpiling would reduce the amount of organic matter contained in the surface horizon by diluting the surface horizon with subsoil. Redistributed soil would have lower organic matter content as a result of salvage and stockpiling. Soil biological activity

would be reduced or eliminated during stockpiling as a result of anaerobic conditions created in deeper portions of stockpiles. After soil redistribution, biological activity would increase and eventually reach pre-salvage levels.

Impacts to physical characteristics of soil include mixing of horizons (loss of soil structure), compaction, and pulverization as a result of equipment handling and traffic; especially during reclamation activities. Soil compaction and pulverization would result in decreased permeability, water-holding capacity, and loss of soil structure. Seedbed preparation activities, including ripping compacted surfaces, would reduce effects of compaction.

NO ACTION ALTERNATIVE

Implementation of the No Action Alternative would eliminate potential impacts of the Proposed Action on soil resources. Impacts to soil associated with other ground disturbing activities in the area would continue.

CUMULATIVE EFFECTS

Impacts to soil from mining, exploration, livestock grazing, off highway vehicle use, and other construction and restoration activities would continue to occur at various levels throughout the Dixie Creek basin. Associated impacts from these activities would include loss of soil productivity due to changes in soil structure from mixing and handling, decreased vegetative cover, water and wind driven soil losses, and compaction from roads, construction, and livestock grazing.

Reclamation associated with mining disturbance and future restoration activities would ameliorate soil loss and reduced vegetative productivity from mine areas. Soil salvaged and used in reclamation would become viable once vegetation is re-established.

IRREVERSIBLE AND IRRETREIVABLE COMMITMENT OF RESOURCES

Soil loss as a result of mining would constitute an irreversible commitment of the resource. Reclamation of disturbed areas using available growth media would re-initiate soil development processes on reclaimed sites. Continuation of soil development would reduce or eliminate the potential irretrievable commitment of soil resources.

POTENTIAL MONITORING AND MITIGATION MEASURES

No monitoring or mitigation measures have been identified by BLM for soil resources.

RESIDUAL ADVERSE EFFECTS

Loss of soil and interruption of natural soil processes and functions (e.g., soil development, infiltration, percolation, water holding capacity, structure, and organic matter) can be reversed by natural soil development over an unknown period.

VEGETATION

SUMMARY

Implementing the Proposed Action would result in disturbance to plant communities, consisting of 11 vegetation types. Reclamation would occur on disturbed areas after mining activities cease. However, approximately 98 acres of the Phase VIII mine pit would not be reclaimed with vegetation. Establishment of big sagebrush communities on reclaimed areas may take decades, and would require special reclamation measures that favor sagebrush over grasses and other herbaceous species.

DIRECT AND INDIRECT IMPACTS

PROPOSED ACTION

The Proposed Action would directly affect about 1,463 acres of upland plant communities as a result of construction of a mine pit, waste rock disposal, heap leach facility, and other ancillary facilities **(Table 4-2)**. Most of the vegetation disturbed by proposed mine development would be dominated by sagebrush (1,064 acres) of which 510 acres have been burned in recent fires. Other plant communities that would be removed by the Proposed Action include juniper woodlands (136 acres unburned and 45 acres burned) and mixed shrub communities (126 acres unburned and 41 acres burned).

The Proposed Action would result in loss of riparian/wetland habitat (0.15 acre) associated with a natural intermittent stream channel in the Project Area. This channel segment would be replaced with an engineered diversion channel that would extend through the southern mine pit area. Potential for riparian habitat to become established within the diversion structure may be limited because the channel would be constructed in bedrock. The bedrock base of the channel may limit rooting depths of aquatic and riparian plants; however, sediment would likely be deposited over the bedrock in low-gradient portions of the channel, which would provide favorable growth medium for aquatic and riparian plants. High flows in the diversion channel could periodically scour and remove deposited sediment and associated vegetation. Dust from roads and mining activities could coat vegetation in areas adjacent to or downwind from dust sources. Dust on vegetation predisposes some species to insect infestation.

Concurrent revegetation during and after mining likely would re-establish permanent and stable vegetation cover within five to ten years, assuming livestock use in the area is deferred and weeds are controlled. Reclaimed plant communities likely would differ in species composition from native pre-mining communities. Reclaimed areas would be dominated by grasses with low densities of native forbs, shrubs, and trees. Big sagebrush, a dominant shrub in the Project Area, would likely be present at lower densities following mining.

INVASIVE, NON-NATIVE SPECIES

Disturbed sites and recently seeded areas are candidates for invasion by undesirable species such as noxious weeds and cheatgrass. Indirect effects of the Proposed Action would include potential movement of weedy species from reclaimed areas to adjacent stands of native vegetation.

TABLE 4-2
Acreages of Plant Community Type Removed by Proposed Action
Emigrant Project

Community Type[1]	Current Acreage in Project Area	Acreage Removed by Proposed Action
Low Sagebrush (LS)	340	211
Burned Low Sagebrush (LS-B; LS-B/LS; LS/LS-B)	145	58
Mountain Big Sagebrush (MBS; MBS/MBS-B)	138	30
Burned Mountain Big Sagebrush (MBS-B; MBS-B/BBS-B; MBS-B/LS-B; MBS/LS)	636	139
Basin Big Sagebrush (BBS; BBS/MSB)	540	313
Burned Basin Big Sagebrush (BBS-B; BBS-B/BBS; BBS-B/JW-B; BBS-B/MBS-B; BBS/BBS-B)	810	313
Mixed Shrub (MS)	140	126
Burned Mixed Shrub (MS-B)	80	41
Juniper Woodland (JW; CC; JW/BBS; JW/MS; MS/JW)	364	136
Burned Juniper Woodland (JW-B)	492	45
Wetlands	2	1
Total Acres	**3,687**	**1,413[2]**

Note: LS = Low Sagebrush; LS-B = Low Sagebrush Burned; MBS = Mountain Big Sagebrush; MSB-B = Mountain Big Sagebrush – Burned; BBS = Big Basin Sagebrush; BBS-B = Big Basin Sagebrush – Burned; MS = Mixed Shrub; MS-B = Mixed Shrub – Burned; JW = Juniper Woodland; JW-B = Juniper Woodland – Burned; CC = Chokecherry.

[1] Specific acreages for community types are contained in the Vegetation Report (Westech 2004a).

[2] Does not include 50 acres of proposed disturbance associated with exploration activities within the proposed mine permit boundary.

NO ACTION ALTERNATIVE

Vegetation resources in the area would not be impacted by implementing the No Action Alternative since no ground disturbance associated with mining activities would occur. Impacts to vegetation associated with other ground disturbing activities in the area would continue. Noxious weed populations could increase because of other non-mining related disturbance, such as grazing, road maintenance, recreation, and vehicle activity.

CUMULATIVE EFFECTS

Cumulative effects on vegetation would result from wildfire, livestock use, and development of the Emigrant Project. Locally and regionally, wildfires have reduced the density of shrubs and trees sensitive to fire (e.g., sagebrush, bitterbrush, and juniper). Fires have resulted in replacement of shrub communities by grass-dominated communities, often with a dominant component of invasive cheatgrass species. Construction and operation of the Rain Mine has removed natural vegetation in areas occupied by the Rain Mine pit and other facilities. Reclamation of Rain Mine facilities is resulting in establishment of vegetative communities on waste rock dumps and eventually, the tailing storage facility.

These cumulative land disturbance activities have altered the composition, density, and spatial distribution of native plant communities. The Proposed Action would incrementally add to this reduction in plant community productivity and diversity and could lead to proliferation of noxious weeds and other invasive species.

proliferation of noxious weeds and other invasive species.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

There would be an irretrievable commitment of resources in the loss of 98 acres of vegetation in the Phase VIII pit area that would not be reclaimed. No irreversible loss of vegetation productivity is expected on areas that would be reclaimed when reclamation is completed; however, species composition of reclaimed areas would differ from pre-mining communities.

Where weed infestations occur, they represent an irretrievable commitment of range productivity. Control of noxious weeds during reclamation would avoid loss of range productivity.

POTENTIAL MONITORING AND MITIGATION MEASURES

MITIGATION

- Newmont would conduct annual weed surveys to direct weed control efforts.
- Newmont's weed control efforts would be continued for the life-of-mine and reclamation period to reduce potential impacts of new infestations. Certified weed free straw bales would be used for sediment control.
- Planting and seeding techniques would be coordinated with BLM and NDOW at closure.
- Implement reclamation measures that favor establishment of big sagebrush on portions of the site. Special measures would be coordinated with BLM and NDOW to control soil loss associated with big sagebrush planting.

RESIDUAL ADVERSE EFFECTS

Post-mining plant communities likely would differ in species composition from native plant communities for several decades (i.e., higher density of grasses and reduced densities of native forbs, shrubs, and trees). Increased density and productivity of grasses would benefit livestock and wildlife with affinities for grassland habitat, but would be detrimental to species dependent on shrub and tree habitats.

SPECIAL STATUS PLANT SPECIES

SUMMARY

The Proposed Action would not affect special status plant species.

DIRECT AND INDIRECT IMPACTS

PROPOSED ACTION

No special status species would be affected; however, populations of cactus protected under Nevada law would be removed by proposed mine development (Westech 2004a), after obtaining the appropriate state permit.

NO ACTION ALTERNATIVE

Special status plant species would not be impacted by implementing the No Action Alternative since no ground disturbance associated with mining activities would occur. Impacts to vegetation associated with other ground disturbing activities in the area, including livestock grazing, would continue.

CUMULATIVE EFFECTS

There would be no cumulative effects on special status plants.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

There would be no irreversible or irretrievable commitments of resources to special status plants.

POTENTIAL MONITORING AND MITIGATION MEASURES

No monitoring or mitigation measures for special status plant species have been identified by BLM.

RESIDUAL ADVERSE EFFECTS

There would be no residual adverse effects to special status plants.

WETLAND/RIPARIAN AREAS

SUMMARY

The Proposed Action would result in removing or filling approximately 0.15 acre of wetlands and 0.88 acre of non-wetland Waters of the U.S. associated with the mine pit, heap leach facility, borrow area, and sediment basin dams.. Wetland mitigation and enhancement would compensate for lost or degraded wetland functions and values that would result from the Proposed Action. The diversion channel that would be constructed through the mine pit area may support wetlands and riparian vegetation if sediment in the engineered channel accumulates to sufficient depth. Riparian areas adjacent to proposed mine facilities would be fenced to protect against livestock grazing and trampling.

DIRECT AND INDIRECT IMPACTS

PROPOSED ACTION

The Proposed Action would result in removing or filling approximately 0.15 acre of wetlands and 0.88 acre of non-wetland Waters of the U.S. associated with the mine pit, heap leach facility, borrow area, and sediment basin dams. These wetlands and non-wetland waters are located along three drainage channels that are

tributary to Dixie Creek (**Figures 3-5** and **3-9**). The northern-most two drainages converge into a single channel near the western side of the proposed mine pit disturbance boundary (**Figure 3-8**). The northern combined channel extends through the proposed mine pit area, and the southern channel through the proposed heap leach facility.

Total acreage for wetlands and non-wetland waters for the northern portion that would be permanently disturbed by the mine pit is 0.15 acre and 0.51 acre, respectively. Total acreage for non-wetland waters for the southern portion that would be permanently filled by the heap leach facility is 0.13 acre; no wetlands are located in this area. Borrow Area #1 would permanently remove approximately 0.12 acre of non-wetlands waters. The four sediment basin dams would temporarily fill about 0.12 acre of non-wetland waters.

Construction of the mine pit would permanently remove a portion of a tributary channel to Dixie Creek that extends through the southern portion of the mine pit area. The drainage channel would be reconstructed as a 3,000-foot long engineered diversion channel excavated in bedrock. Depending on drainage features of the channel, sediment may be deposited over the bedrock at sufficient depth to support riparian and wetland plant species. This sediment and associated vegetation would be at risk of being removed by scouring during high stream flow events in the diversion channel; however, portions of wetland vegetation would likely remain or rapidly re-establish following floods. Sediment contribution from the Emigrant Mine disturbance would be expected to continue until reclamation results in adequate vegetative cover on disturbed areas.

NO ACTION ALTERNATIVE

Implementation of the No Action Alternative would result in no additional impacts to wetlands/riparian areas in the Study Area. Impacts to wetland/riparian areas associated with other ground disturbing activities in the area would continue.

CUMULATIVE EFFECTS

Sediment resulting from livestock use, fires, roads, and other factors of surface disturbance would increase sediment discharge to surface water drainages. Proposed, existing, and future mine development would also reduce vegetation cover in wetlands, riparian areas, and on uplands. Cumulatively, these factors degrade wetlands and riparian areas, and destabilize stream banks. Two wetland/riparian enclosures and a riparian pasture were constructed along Dixie Creek downstream of where the tributary channels that cross the Project Area join Dixie Creek. This protected riparian area has developed highly functioning wetland and riparian communities that help reduce sediment load in the stream and reduce amounts of sediment reaching South Fork Humboldt River.

Proposed sediment control actions that would be implemented at the onset of ground disturbance, including installation of sediment collection basins and other BMPs, would reduce contribution of sediment from the proposed mine development. These sediment control features would be maintained to ensure sediment loads from mine development would be minimized and not transported downstream to Dixie Creek and South Fork Humboldt River.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

The Proposed Action would result in removing or filling approximately 0.15 acre of wetlands and 0.88 acre of non-wetland Waters of the U.S. Although mitigation measures would

compensate for this loss, there may be reduced potential to develop wetlands in the permanent diversion channel constructed through the mine pit area. If stable wetlands do not develop, there would be an irreversible and irretrievable loss of wetland acreage in the Project Area. Newmont is seeking a Section 404 Permit (pursuant to the Clean Water Act) from the U.S. Army Corps of Engineers to address loss of jurisdictional wetlands.

POTENTIAL MONITORING AND MITIGATION MEASURES

MITIGATION

- Fence wetlands and riparian areas adjacent to the proposed mine-disturbance area to reduce effects of livestock on vegetation and stream banks. Sites include springs at the following locations:
  - NE¼Section 28, Township 32 North, Range 53 East
  - SW¼NW¼, Section 27, Township 32 North, Range 53 East
  - NE¼SE¼, Section 27, Township 32 North, Range 53 East.
- Natural design for stream channel diversion (will facilitate growth and establishment of riparian vegetation).
- Reconstruct/maintain Emigrant Spring enclosure using wildlife-friendly Liberty pipe (or equivalent) fence in problem areas.
- Control weeds at Emigrant Spring enclosure.

RESIDUAL ADVERSE EFFECTS

No residual adverse effects to wetlands/riparian areas have been identified by BLM.

FISHERIES AND AQUATIC RESOURCES

SUMMARY

Approximately 0.15 acre of aquatic habitat along a natural intermittent stream channel would be removed by the proposed mine pit, which would eliminate a small population of Lahontan speckled dace, Lahontan redside shiner, and aquatic macroinvertebrates. The new diversion channel that would be constructed in the mine pit area would likely allow fish passage during periods of low velocity stream flow; however, this channel probably would not support resident fish populations. The channel, constructed primarily in bedrock, would likely not support wetland and riparian vegetation to the degree necessary to support resident fish populations. Sediment control basins constructed in the drainage channel would preclude fish from migrating through the Project Area during life-of-mine operations. Once reclamation is completed and sediment control basins have been removed, fish could potentially migrate through the area depending on flow conditions.

DIRECT AND INDIRECT IMPACTS

PROPOSED ACTION

Aquatic resources (i.e., Lahontan speckled dace, Lahontan redside shiner, and aquatic invertebrates) and their habitat would be removed from a portion of a tributary stream channel in the northern portion of the Project Area. Approximately 3,000 feet of a natural drainage channel would be removed by the proposed mine pit and replaced with an engineered diversion channel. Approximately 1,000 lineal feet of this natural channel (0.15 acre) that would be removed supports aquatic habitat. Additional aquatic habitat would remain upstream (west) of the undisturbed portion of the drainage. These undisturbed stream channels are fed by several small springs and seeps (including Emigrant Spring) and would not be affected by the proposed mining operations.

Construction of a new diversion channel through the mine pit area would likely reduce or eliminate opportunities for fish passage. Under high flows, velocities are likely to be too high for small fish species such as dace and shiners. These species are associated with low flow velocities and tend not to occur where gradients and velocities are high (Elliott 2005). The proposed design gradient of 3 percent is relatively steep in terms of effects to fisheries (Evans 2005). Because the channel would be constructed primarily in bedrock, there would be low potential for fish populations to become established in the new channel even under low flow conditions. In-stream habitat (mid-channel scour and meander pools) and side channel habitat (lateral-scour pools and overhanging banks) would not form in this diversion channel.

Low potential for aquatic and riparian vegetation to develop in and along the constructed channel would likely limit colonization by fish because the channel would lack hiding cover and not support the production of benthic invertebrates (e.g., aquatic insects and snails), the primary food of many fish. Benthic invertebrate production is dependent on suitable aquatic vegetation and streambed substrate. Reduced aquatic vegetation may increase slightly the temperature of surface water within and downstream of the diversion channel.

Proposed construction of four sediment basins (see **Figure 2-2**) would also have the effect of blocking upstream and to some extent downstream, fish migration through the Project Area. Sediment ponds would include perforated 2- to 3-feet diameter drain pipe to accommodate flow through the pond. Fish may move downstream through the pipes, but unlikely to move upstream since a portion of the pipes would be vertical. Although the ponds would have spillways, they would not be used except under high flow velocities. Culverts for road crossings may also impede movement of fish (Evans 2005).

Other impacts (primarily sediment) from mining activities could affect water quality below the Project Area to Dixie Creek and points farther downstream in South Fork Humboldt River. Currently, impacts from increased sediment transport are anticipated to be small because Newmont would implement BMPs to minimize sediment loss from the site.

Stream channel segments upstream from the proposed mine disturbance that typically contain year-round flow would be isolated from downstream portions of the drainage that extend to Dixie Creek for the life-of-mine. Seasonal or long-term isolation of the tributary drainage upstream from the mine area would increase the probability that speckled dace and redside shiner could be extirpated from the drainage by climatic factors (i.e., drought or ice formation to the bottom of pools). Habitat in the tributary channels west of the Project Area (including the fenced Emigrant Spring enclosure)

appears to be marginal for fish and likely subject to periodic fish die-offs during dry times in summer and cold periods in winter. During the life-of-mine the Proposed Action would likely eliminate potential for fish from downstream areas (originating in Dixie Creek) to move upstream through the new diversion channel, and to upstream drainages west of the Project Area.

NO ACTION ALTERNATIVE

Potential impacts to fisheries and aquatic resources that would result from development of the Emigrant Project would not occur for the No Action Alternative. Impacts to fisheries and aquatic resources associated with other ground disturbing activities in the area would continue.

CUMULATIVE EFFECTS

Sedimentation from roads, livestock grazing issues and wildfire would act cumulatively with the Proposed Action to reduce stream shading, increase water temperature, and increase sediment delivery to Dixie Creek, its tributary channels, and possibly South Fork Humboldt River during periods of stream flow. For most of these drainages, flow occurs only during snowmelt runoff and major rain events. Exceptions include South Fork Humboldt River and a 5-mile restored portion of lower Dixie Creek. Removal of a portion of the tributary channel in the mine pit area, along with grazing and trampling in the drainage downstream from the proposed Emigrant Project, could result in decreased aquatic habitat throughout its reach to the confluence with Dixie Creek and points farther downstream.

This change in water quality (increased temperature and sedimentation) could affect the aquatic community in several ways. Although the majority of fish species (non-game and warm water species) have adapted to periods of high sedimentation and warm temperatures, high sediment levels and increased temperatures for long durations may cause some fish to avoid these areas. Most salmonids, as well as many of the other aquatic species, require habitat with little sediment. Suspended sediment can directly affect respiration of these species and an increase in embeddedness can reduce potential spawning habitat. Sediment increases can also negatively affect prey species (macroinvertebrates). Loss or reduction in populations of these prey-base species can be amplified through other species higher up the food chain.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Aquatic resources (fish, macroinvertebrates, periphyton, vegetation) are generally considered renewable, however the irreversible and irretrievable loss of aquatic habitat resulting from the mine pit would permanently reduce the ability of the Project Area to support fish and other aquatic organisms. Fish may continue to move downstream through the diversion channel. Under the Proposed Action, the potential to improve riparian and aquatic habitat in the new diversion channel likely would be reduced because it would be constructed in bedrock.

POTENTIAL MONITORING AND MITIGATION MEASURES

MONITORING

- Prepare a water quality monitoring plan with contingencies including implementation of additional BMPs to control sediment as needed.
- Monitor surface water flow and quality in the vicinity of mine facilities, including Dixie Creek and possibly South Fork Humboldt River.
- Monitor groundwater quality in the vicinity of the mine pit, waste rock disposal facility, and heap leach facility for constituents of concern.
- Monitor depth to groundwater in production wells and piezometers located in Dixie Creek Valley.

MITIGATION

- Provide a natural design for the new diversion channel (to include roughness features, step pools, and substrates for vegetation establishment as applicable) through the proposed mine pit area to allow establishment of aquatic life.
- Reconstruct/maintain Emigrant Spring enclosure for benefit of fish.
- Install culverts in a manner to not preclude passage of aquatic life within engineering constraints.
- Review status of native fish populations and macroinvertebrates in Emigrant drainage and reconstructed diversion channel every five years. Re-establish fish and macroinvertebrate populations into the channel as necessary or warranted.

RESIDUAL ADVERSE EFFECTS

No residual adverse effects to fisheries/aquatic resources have been identified by BLM.

WILDLIFE RESOURCES

SUMMARY

Direct impacts to wildlife resulting from the Proposed Action would be loss of habitat and the subsequent displacement or loss of wildlife. Direct loss of wildlife habitat would eliminate cover (nesting, hiding, and thermal), breeding sites, and forage. Most of the affected habitat within the Study Area consists of sagebrush/bunchgrass communities. Construction of new haul roads, ancillary facilities, and mine development would result in 1,413 acres of habitat loss, most of which is dominated by sagebrush. Reclamation of disturbed lands would eventually restore habitat for some species; however, species dependent on plant communities with a large component of big sagebrush, and trees would experience a net loss in habitat quality as a result of the Proposed Action.

DIRECT AND INDIRECT IMPACTS

PROPOSED ACTION

The Proposed Action would result in direct loss of approximately 1,413 acres of upland habitat including approximately 0.15 acre of riparian and wetland habitat, until such habitat is reclaimed. Habitat removed would include sagebrush communities (1,064 acres), juniper woodlands (181 acres), and mixed shrub communities (167 acres). Loss of habitat would reduce local availability of forage, security, and breeding cover for wildlife inhabiting the area. All species dependent on these disturbed sites would be killed or displaced. Displaced animals may be incorporated into adjacent populations, depending on variables such as species behavior, density, and habitat quality. Adjacent populations may experience increased mortality, decreased reproductive rates, or other compensatory or additive responses.

There would be a loss of habitat from mine development until reclamation is successful; consequently, the capacity of the Study Area to support current levels of wildlife would be reduced until suitable habitat (including sage brush, other shrubs, and trees) has re-established. Vegetation on reclaimed areas would likely be dominated by grasses with low densities of native forbs, shrubs, and trees. Sagebrush and other shrubs, typically, are difficult to re-establish on mined lands (see *Vegetation* section in this chapter) and areas burned by wildfire (Vicklund *et al.* 2004; Schuman and Booth 1998; NDOW 2003).

Species that would experience the greatest impacts from loss of sagebrush habitats include black-tailed jackrabbit, mountain cottontail, sage grouse, mule deer, and pronghorn antelope. These species depend on sagebrush and other shrubs for food and cover, especially in winter. During spring and early summer when newly planted grasses and forbs on reclaimed areas are succulent and rapidly growing, mule deer, pronghorn, rabbits and other small mammals would be attracted to reclaimed areas because of the seasonably abundant forage. During late summer, fall, and winter reclaimed areas would become desiccated and provide little forage or cover for most wildlife species, other than mice, voles, and other small mammals. The availability of adequate shrub-dominated habitat in winter is critical to survival of mule deer, pronghorns, sage grouse, and rabbits.

Mule deer and antelope using the Study Area for year-round and wintering habitat would be displaced. Migration of mule deer through the Study Area likely would be impeded by the mine, ancillary facilities, and service road between the Rain Mine and Emigrant Project Area; however, mule deer would not be entirely prevented from migratory movements. The service road between the two mines would be 35 feet wide and would have sporadic traffic from vehicles needing to be serviced at the shops at the Rain Mine. The service road would not have berms or fences that would exclude mule deer. Most migrating mule deer likely would become accustomed to traffic on the service road and would cross the roads to gain access to traditional ranges to the north and south of the mine site. Traffic on the service road and haul road from the pit to heap leach facility would pose a mortality risk to deer and other wildlife.

Lizards, snakes, and insects would be killed by construction activities and vehicle traffic. Often lizards and snakes seek cover underground and removal of soil and rock would result in direct mortality. There have been no reptiles identified in the Study Area for which reduced population viability or reduction in habitat poses a threat to their continued existence regionally and locally.

Raptors that forage over sagebrush and grassland habitats would experience a reduced

prey base due to a reduction in sagebrush/grassland and juniper woodland habitats until successful reclamation is achieved. Raptors also would be affected by loss of potential nesting habitat in juniper woodlands. Because most raptors usually range over a large area, this loss would not be quantifiable and would not result in a change in raptor diversity. Typically, reclaimed land is rapidly invaded by small mammals, often within one to two years following the start of reclamation (Hingten and Clark 1984a, 1984b). Populations of small mammals on reclaimed land would provide a prey base for raptors, even during early stages of reclamation. No known raptor nests would be directly affected by the Proposed Action.

Some chukar habitat (steep, rocky slopes) would be lost, but this loss would be a relatively small incremental effect when compared with habitat availability in the region. Loss of sagebrush habitats would also have potential to impact chukar nesting, brooding, and winter cover habitat (BAER 1999).

Mourning doves would be affected by loss of nesting habitat with removal of 181 acres of juniper woodland. Removal of riparian vegetation associated with the drainage from Emigrant Springs would reduce foraging opportunities for mourning doves. The Proposed Action would result in a reduced capacity of the Study Area to support mourning doves. This loss would be an incremental effect that would have negligible effects on regional populations of mourning doves.

If wildlife were to consume water containing lethal concentrations of cyanide from the leach pads, they likely would be killed; however, stipulations of the Industrial Artificial Pond Permit program administered by Nevada Department of Wildlife specify that wildlife access to lethal solutions must be precluded. Daily monitoring and reporting of wildlife mortality from heap leach facilities is required under this permit.

Noise levels associated with the Proposed Project would increase, displacing some animals an unknown distance from the noise source. Some individuals would likely abandon habitat near high levels of noise and human disturbance; whereas, others would become accustomed to noise and associated human activity and resume their use of otherwise unaffected habitat.

Migratory birds would experience losses of foraging and nesting habitats in sagebrush-grasslands and juniper woodlands. If mine construction were to take place in the nesting and brood-rearing period, young birds would be killed and nests would be destroyed.

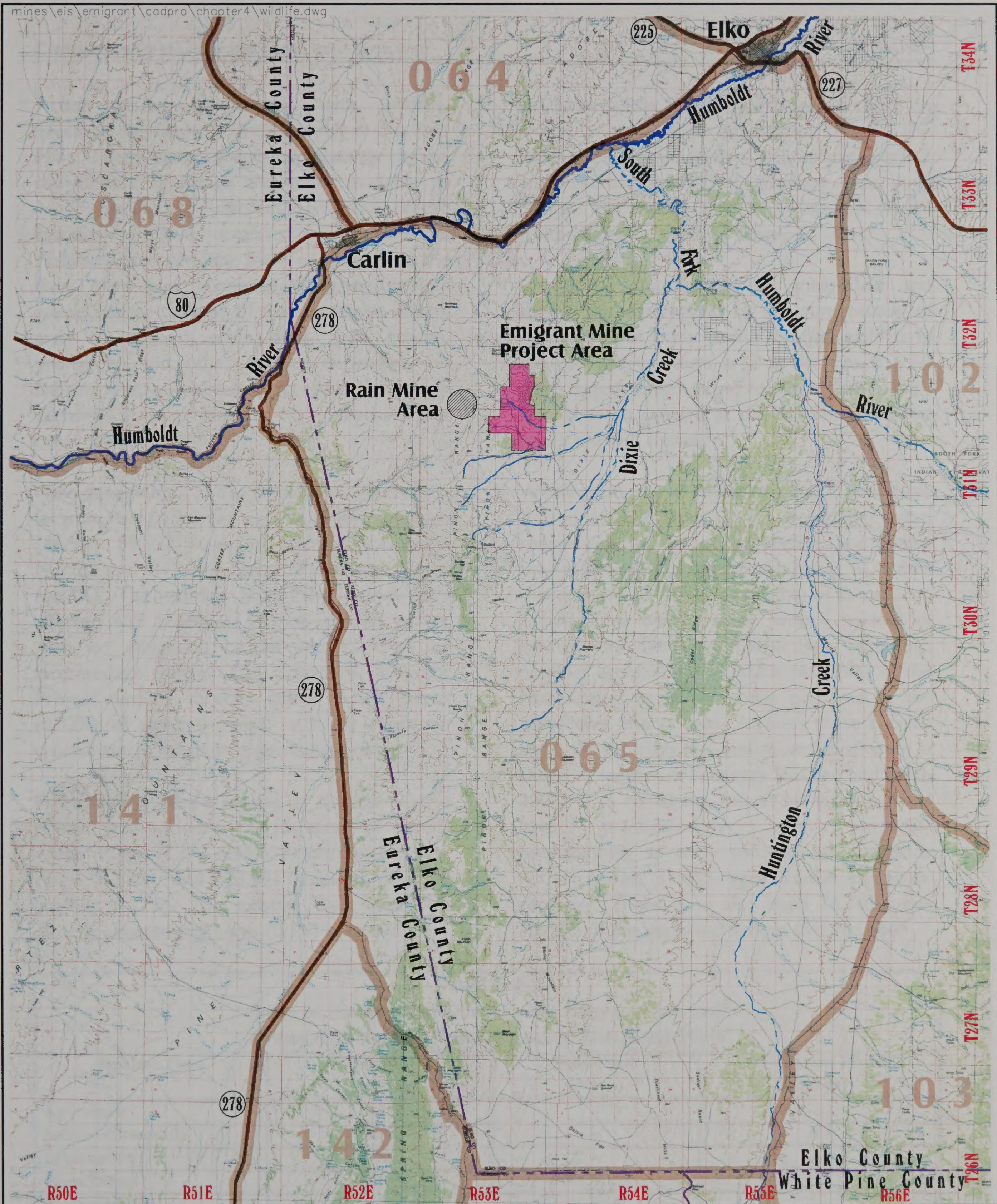
Bats would experience reduced habitat quality through the removal of juniper trees and fractured rock faces. Bats would experience a loss of roosting habitat (e.g., trees and fractured rock faces) and foraging areas over upland and wetland habitats removed by the proposed mine and ancillary facilities. Currently, the Study Area has a high diversity of bat species (See *Special Status Wildlife Species* section). The Proposed Action would reduce the diversity of bats in the disturbance area through removal of foraging and roosting habitat.

NO ACTION ALTERNATIVE

Impacts to terrestrial wildlife resources resulting from implementation of the Proposed Action would not occur under the No Action Alternative. Impacts to wildlife resources associated with other ground disturbing activities in the area would continue.

CUMULATIVE EFFECTS

The cumulative effects area for wildlife is Big Game Management Area 065 (**Figure 4-2**), encompassing approximately 631,000 acres. Effects to terrestrial wildlife in the cumulative effects area would result from the Proposed



Base Map Source: Sure!MAPS RASTER 1:100,000 Nevada Map

N

0 Miles 6

065 Big Game Management Unit Number and Boundary (Nevada Department of Wildlife)

Highway

Big Game Management Units
Emigrant Mine Project
Elko County, Nevada
FIGURE 4-2

Action acting cumulatively with wildfire, livestock use, and closure activities at the Rain Mine. These factors would cumulatively reduce the amount of forage and cover available to wildlife resulting in decreased capacity of the cumulative effects area to support wildlife. Habitat losses resulting from operations at the Rain Mine and proposed Emigrant project would reduce capacity of the cumulative effects area to support mule deer, sage grouse, pronghorn and other species dependent on habitats that are difficult to re-establish through reclamation (e.g., juniper, big sagebrush, and other shrubs).

Mule deer habitat in the cumulative effects area includes 104,065 acres of crucial winter range (16.5%), 59,322 acres of intermediate range (9.4%), and 419,599 acres of summer range (66.5%). The existing Rain Mine has directly affected 639 acres (0.15%) of summer range, with no effect on crucial winter range or intermediate range. The proposed Emigrant Project would directly affect 1,463 acres (0.32%) of summer range, with no effect on crucial winter range or intermediate range.

Pronghorn antelope habitat in the cumulative effects area includes 13,615 acres of crucial winter range (2.2%), 266,638 acres of summer range (42.3%), and 323,091 acres of yearlong habitat (51.2%). The existing Rain Mine has directly affected 639 acres (0.2%) of antelope yearlong habitat, but would have no effect on crucial winter range or summer range. The proposed Emigrant Project would directly affect 1,463 acres (0.44%) of antelope year long habitat, but would have no effect on crucial winter range or summer range.

Quality of winter range for mule deer and antelope is determined by the composition of sagebrush and other shrub species. Habitat in the cumulative effects area is dominated (>60 %) by sagebrush/grassland habitats (**Table 4-3**). Habitat types present at the Rain and Emigrant mines are also shown.

Wildfires in the cumulative effects area have altered 245,858 acres (39 %) of wildlife habitat, reducing amounts of sagebrush and other species sensitive to effects of burning. BLM data shows that 138,497 acres (56.3%) of this altered habitat have been treated with a variety of rehabilitation measures (**Table 4-4**). Sagebrush seedings account for 59,002 acres (24%) of the rehabilitated acres that have occurred in the cumulative effects area. As such these treated areas are probably in a mid-successional state in terms of sagebrush recovery (Burton and Lamp 2005). The remaining, untreated wildfire areas have predominantly been naturally reestablishing as early successional grasslands (77,165 acres, 31.4%), with limited sagebrush recovery. There have also been 26,749 acres (10.9%) of fire impacted habitat that has been

TABLE 4-3
Area of Habitats in Cumulative Effects Area and Areas Affected by Rain Mine and Emigrant Mine

Habitat Type	Area 065 (acres)	Rain Mine (acres)	Emigrant Mine (acres)
Agriculture	20,945	--	--
Meadow/Grassland	25,125	--	167
Greasewood	1,303	--	--
Piñon/Juniper	27,696	--	181
Mountain Shrub	15,007	--	--
Sagebrush/Grassland	509,421	639	1,064
Riparian	3,952	--	1
Total	**603,449**	**639**	**1,413**

Source: Burton and Lamp 2005.

Table 4-4
Acreage of Rehabilitation Treatments in Cumulative Effects Area

Area Burned by Wildfires 245,858	Aerial Sagebrush Seedings	Other Seedings (grasses)	Weed Treatments	Greenstrips	Reforestation
	59,002	60,123	445	1,668	17,259

Source: Burton and Lamp 2005.

invaded by cheatgrass, and an additional 3,446 acres (1.4%) that has been invaded by cheatgrass mixed with Wyoming big sagebrush. In general, more than 50% off all burned areas within the cumulative effects area have been treated to improve or stabilize wildlife habitat (Burton and Lamp 2005).

Of the remaining 385,142 acres (61%) of the cumulative effects analysis area, approximately 99,000 acres (25.6%) of habitat that has not been impacted by wildfire within the past 20 years and is classified as being in early seral condition. These areas are susceptible to cheatgrass invasion following wildfire events. An additional 72,124 acres (18.7%) of the cumulative effects area not impacted by wildfire have been seeded to crested wheatgrass (Burton and Lamp 2005).

Data are available for approximately 18 important perennial stream habitats in the cumulative effects area encompassing 167 miles of stream reach or an estimated 433 acres of stream habitat. No information is available for 5 perennial streams in the management unit. Of the 18 streams for which data are available, the data is representative of the 48 miles of stream reach on public land portions (about 41% or approximately 125 acres of stream habitat of the total stream miles evaluated) (Burton and Lamp 2005).

Data on functioning condition of seeps and springs on public land was collected in 2003 for areas within the cumulative effects analysis area (**Table 4-5**). Springs and associated riparian areas are important for wildlife use. Riparian habitat associated with springs in the cumulative effects area were rated predominantly to be non-functional or functioning at risk with a downward trend (>50 %) from impacts from land use practices (Burton and Lamp 2005).

Habitat conditions for streams on public land in the cumulative effects area are variable and depend largely on management initiatives. Some of the more important streams including Dixie Creek, Little Porter Creek, portions of Trout Creek, and the South Fork of the Humboldt River, are either fenced or have had recent changes in grazing management practices resulting in improved habitat conditions with an upward trend. Limited public land portions of Huntington Creek and the Humboldt River, however, were recently rated as nonfunctional. Conditions on most remaining smaller drainages, including Emigrant Springs drainage in the Project Area, generally are poor. Livestock grazing on many of the smaller drainages is season-long.

Reclamation of areas disturbed by the Proposed Action would result in rehabilitation of wildlife habitat on all acres except bedrock high walls of the mine pit and water diversion channels. The degree to which reclamation would replace habitats destroyed by mining would depend on species composition and structure of post-mining habitats. Reclaimed habitats likely would have a higher density of grasses than pre-mining habitats.

Existing and proposed mine-related disturbances to wildlife habitat would affect 2,052 acres (3%) of the cumulative effects area.

TABLE 4-5
Summary of Riparian Habitat Condition Data for Springs in Big Game Management Unit Area 065[1]

Total Acres	80.17
PFC Acres	6.01
FARU Acres	20
FARD Acres	50.5
NF Acres	3.66

Source: Burton and Lamp 2005.

[1] Data are for BLM administered lands only.

PFC=Proper Functioning Condition. A stream is in proper functioning condition if adequate vegetation, landform, or large woody debris is present to: dissipate stream energy associated with high water flow; filter sediment, capture bed load, and aid floodplain development; improve flood-water retention and ground-water recharge; develop root masses that stabilize streambanks; develop diverse ponding and channel characteristics; and, support greater diversity.

FAR= Functioning at Risk; includes streams for which one of its attributes/processes gives it a high probability of degradation with a relatively high flow event:

FARU=Functioning at Risk Upward Trend; were the probability of degradation is declining;

FARD=Functioning at Risk Downward Trend; were the probability of degradation is increasing.

NF=Nonfunctional; includes streams which clearly lack the elements described in the PFC definition. *From*: Riparian Area Management, A User's Guide to Assessing Proper Functioning Condition and the Supporting Science for Lotic Areas. TR 1737-15, 1998. BLM, Denver, CO.

Impacts from wildfires, livestock grazing, and vegetation conversion (crested wheatgrass seedings) have adversely affected wildlife over a significant portion of the cumulative effects analysis area (317,982 acres or 50%). Restorative efforts including seedings, weed treatments, greenstrips, reforestations and control of grazing in riparian areas have also improved wildlife habitat (Burton and Lamp 2005).

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Irreversible and irretrievable loss of wildlife habitat from the unreclaimed mine pit and highwalls would result in a loss of 98 acres of habitat for some species of wildlife (e.g., mule deer, small mammals); however, the high wall could provide habitat for other species such as bats and raptors.

POTENTIAL MONITORING AND MITIGATION MEASURES

MITIGATION

- Provide a natural design for the new diversion channel (to include roughness features, step pools, and substrates for vegetation establishment as applicable) through the proposed mine pit area to allow establishment of aquatic life.
- Construct four game guzzlers.
- Fence wetlands and riparian areas adjacent to the proposed mine-disturbance area to reduce effects of livestock on vegetation and stream banks. Sites include springs at the following locations:
    - NE¼Section 28, Township 32 North, Range 53 East
    - SW¼NW¼, Section 27, Township 32 North, Range 53 East

- NE¼SE¼, Section 27, Township 32 North, Range 53 East.

RESIDUAL ADVERSE EFFECTS

Impacts of mitigation measures described above would generally be positive. Fencing some areas would exclude livestock grazing; however, most fences would remain in-place. Species composition and structure of reclaimed habitat may over the long-term (decades) be sub-optimal for wildlife species dependent on sagebrush and other shrubs because of reduced densities of big sagebrush and other shrubs.

SPECIAL STATUS WILDLIFE SPECIES

SUMMARY

The threatened bald eagle and Lahontan cutthroat trout would not be affected by the Proposed Action. Removal of upland and wetland vegetation would reduce bat foraging opportunities until reclamation is successful. Bat roosting habitat (cliffs, rock crevices, and juniper trees) in the mine pit area would be removed. Habitat for Preble's shrew, pygmy rabbit, and burrowing owl may be affected by the Proposed Action; however, these species have not been confirmed to occur in the Study Area. Foraging habitat for Swainson's and ferruginous hawks would be reduced; however, no nests would be affected. Brooding, wintering, and foraging habitat for sage grouse would be reduced through loss of unreclaimed habitat in the last phase of the mine pit. Reduced sagebrush density would further diminish the quality of post-mining habitat. Increased sediment could adversely affect white-faced ibis and California floater in South Fork Humboldt River, if sediment levels increase in these surface water systems as a result of the Proposed Action.

DIRECT AND INDIRECT IMPACTS

PROPOSED ACTION

Bald Eagle (Threatened)

Bald eagles are primarily associated with aquatic habitats due to the presence of fish and waterfowl, their favored winter prey, but also forage over upland sites for rodents and carrion. The Proposed Action would not affect bald eagles because they have not been documented in the Study Area and no nesting habitat is present.

Lahontan Cutthroat Trout (Threatened)

Lahontan cutthroat trout would not be affected by the Proposed Action, however, opportunities to re-establish cutthroat in lower Dixie Creek may be reduced if increased sediment or other water quality impacts from the Emigrant Project affect Dixie Creek. Sediment retention measures would help reduce potential for adverse impacts to water quality in Dixie Creek and South Fork Humboldt River.

Bats (Sensitive)

Removal of an intermittent channel, rock outcrops, and juniper trees could affect bats foraging and roosting in the Study Area. Seven

species of bats utilizing habitat in the Study Area could be affected by reduced amounts of foraging and roosting habitat. With the exception of the big brown bat and long-legged myotis, other potentially affected species would be at moderate or high risk. Loss of foraging and roosting habitat would have the greatest potential to affect the western red bat, a species whose populations and habitat are at high risk (Nevada Bat Working Group 2002). The western red bat is dependent on trees for nesting and breeding. Aspen and cottonwoods are generally thought to be favored by the western red bat. Over the life of the mine, bat diversity and density in the Study Area would decrease as bats currently using the project would be displaced.

Direct mortality to bats could result from exposure to lethal levels of cyanide in the heap leach facility; however, the Industrial Artificial Pond Permit program administered by NDOW specifies that lethal levels of cyanide solutions not be accessible to bats, birds, and other wildlife. No caves, mine adits, or abandoned buildings, often used as nursery colonies or hibernation sites for some bat species, would be affected by the Proposed Action. Removal of wetlands would reduce the drinking water availability and foraging area for bats.

Pygmy Rabbit (Sensitive)

Pygmy rabbit habitat along the tributary drainage from Emigrant Spring would be removed by the Proposed Action; however, it is uncertain if pygmy rabbits are present in the Study Area. Fecal pellets from rabbits and burrows are present, but there has not been visual confirmation that pygmy rabbits are present. Proposed reclamation would not likely establish sagebrush communities with densities similar to pre-mining conditions; therefore there would be a decrease in quality of pygmy rabbit habitat in the Study Area. The loss of sagebrush habitat would be a small incremental reduction locally and regionally and not affect the viability of this species.

Preble's Shrew (Sensitive)

Potential habitat for Preble's shrew would be removed by the Proposed Action. It is not known if the Preble's shrew is present on the Study Area; if present the Proposed Action could result in direct mortality through excavation and other construction activities.

Burrowing Owl (Sensitive)

Potential habitat for the burrowing owl includes sagebrush and grassland habitats in the Study Area with sufficient friable soil for burrows to be constructed for nesting. Mine development would remove potential nesting and foraging habitat until reclamation is achieved. The degree to which nesting habitat would be suitable in reclaimed areas would depend on vegetation characteristics, soil texture, and degree of compaction. The loss of nesting and foraging habitat during mining would have negligible effects on burrowing owls because they are not known to be present in the Study Area.

Swainson's and Ferruginous Hawks (Sensitive)

The Proposed Action would remove foraging habitat for Swainson's and ferruginous hawks, but no known nest sites would be affected. The removal of juniper trees would remove potential nesting habitat for ferruginous hawks. The incremental reduction in the prey base of these species by the Proposed Action would slightly reduce the foraging area for these raptors, but this reduction would be slight in a regional context and would not likely affect population density.

Sage Grouse (Sensitive)

No known sage grouse courtship sites (leks) would be affected by the Proposed Action; however, sagebrush, grassland, and riparian habitats that would be removed provide nesting, brood rearing, and wintering habitat. If mine construction were to take place during the nesting and brood-rearing period, mortality to chicks and nestlings could occur. Because sage grouse are dependent exclusively on sagebrush as a winter food source, the reduction in density and extent of sagebrush could reduce the capability of the Study Area to support sage grouse. The Proposed Action would likely result in the long-term reduction of habitat quality for sage grouse.

White-faced Ibis (Sensitive)

Impacts to the white-faced ibis could result if the Proposed Action increases sediment delivery to Dixie Creek and South Fork Humboldt River. Removal of vegetation and soil disturbance associated with construction and operation of the proposed mine and ancillary facilities would have the potential to increase sediment levels in ephemeral drainages that discharge to Dixie Creek and the South Fork Humboldt River via Dixie Creek. Increased sediment levels could reduce food sources (aquatic invertebrates, amphibians, and fish), reduce foraging efficiency, and adversely affect vegetation providing hiding and nesting cover for the ibis. Effects of possible increased sediment delivery from the Proposed Project would depend on the timing and magnitude of sediment increases. Sediment increases would have the greatest potential to affect the white-faced ibis during nesting and brood-rearing periods.

California Floater (Sensitive)

Impacts to the California floater could result if the Proposed Action increases sediment delivery to the South Fork Humboldt River. Removal of vegetation and soil disturbance associated with construction and operation of the proposed mine and ancillary facilities would have the potential to increase sediment levels in ephemeral drainages that discharge to Dixie Creek and ultimately to the South Fork Humboldt River. High levels of sediment could impair feeding behavior and the ability of this mussel to strain food from the water. Prolonged high sediment levels could also adversely affect populations of native minnows, the host for mussel larvae. Magnitude and duration of potential water quality impacts would depend on levels of sediment that the Proposed Action would contribute to Dixie Creek and South Fork Humboldt River. However, sediment retention measures will help reduce the potential for adverse impacts to water quality in Dixie Creek and South Fork Humboldt River.

Nevada Viceroy (Sensitive)

The Proposed Action would not affect the Nevada viceroy or its habitat.

NO ACTION ALTERNATIVE

Under the No Action Alternative, Newmont would not be authorized to develop defined ore reserves or undertake any of the previously described associated activities. Potential impacts to special status species from development of the Project would not be realized. Impacts from previously authorized activities would continue under the No Action Alternative.

CUMULATIVE EFFECTS

Effects to special status species would result from the Proposed Action, acting cumulatively with wildfire, livestock grazing, and operation and closure of the Rain Mine. These factors would cumulatively reduce the amount of forage and cover available to special status

species resulting in decreased capacity of the Study Area and adjacent areas to support them.

Though sage grouse habitat in the cumulative effects area is dominated (>70%) by sagebrush/ grassland habitat, wildfires, grazing and vegetation conversion over the last 20 years in this area has altered large areas of grouse habitat by reducing sagebrush amounts. The quality of sage grouse habitat is determined by the density and age of big sage brush communities. Riparian areas are also crucial components of sage grouse brood rearing. Data collected on springs within the analysis area indicating a >50 percent functioning at risk, downward trend rating suggest adverse effects to sage grouse population trends (see *Wildlife Resources* Cumulative Impacts section in this chapter) (Burton and Lamp 2005).

Sediment delivery to Dixie Creek and South Fork Humboldt River from activities in the watershed that remove surface vegetation and disturb soil (e.g., livestock grazing, fire, roads, and mining), cumulatively would have potential to adversely affect the California floater and white-faced ibis. Relative contribution of these various activities in the watershed to sediment delivery to Dixie Creek and South Fork Humboldt River is not known.

Sage grouse habitat (**Table 4-6**) in the cumulative effects area includes 569,099 acres of late summer habitat (90%), 61,644 acres of summer habitat (9.8%), 400,776 acres nesting and early brood-rearing habitat (63.5%), and 312,072 acres of wintering habitat (49.5%). These acreage figures reflect that some of the same areas provide more than one type of habitat (e.g., nesting and wintering habitat can occur in the same area). The existing Rain Mine has directly affected 639 acres (0.16%) of nesting and brood-rearing habitat, 639 acres (0.2%) of winter habitat, and 639 acres (1.04%) of summer habitat (all of these are present on the same 639 acres). The Emigrant Project would affect 1,280 acres (0.32%) of nesting and brood-rearing habitat, 1,463 acres (0.46%) of winter habitat, and 1,463 acres (0.25%) of late summer habitat.

Wildfires in the cumulative effects area have altered large areas of wildlife habitat, substantially reducing amounts of sagebrush and other species sensitive to effects of burning. The quality of sage grouse habitat is determined by the density and age of big sagebrush communities. Habitat in the cumulative effects area is dominated (>80%) by sagebrush/ grassland habitats (Burton and Lamp 2005).

TABLE 4-6
Areas of Sage Grouse Habitat in Cumulative Effects Area and Areas Affected by Rain Mine and Emigrant Mine

Sage Grouse Habitat	Area 065	Rain Mine	Emigrant Mine
Intact sagebrush	86,561	243	--
Perennial grassland	24,1510	--	30
Sagebrush/cheatgrass	89,842	337	927
Wyoming big sage	15846	--	--
Cheatgrass	33,647	--	156
Piñon/juniper	30,866	--	--
Other	90,160	59	300
Total	**588,432**	**639**	**1,463**

Source: Burton and Lamp 2005

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Irreversible and irretrievable loss of habitat from the unreclaimed portion of the mine pit (pit highwall) is not expected to permanently reduce the potential of the Study Area to support the diversity of species that it currently supports; however, densities of species dependent on shrub and tree habitats may decline if reclamation does not re-establish plant communities dominated by sage brush, juniper, and piñon pine in sufficient quantity and quality.

POTENTIAL MONITORING AND MITIGATION MEASURES

MITIGATION

- Purchase two Anabat recording devices and three night shot cameras.
- Construct rock piles and drill or blast holes for bat roosting in highwalls and other rock faces.
- Provide a natural design for the new diversion channel (to include roughness features, step pools, and substrates for vegetation establishment as applicable) through the proposed mine pit area to allow establishment of aquatic life.
- Fence wetlands and riparian areas within and adjacent to the proposed mine-disturbance area to reduce effects of livestock on vegetation and stream banks. Sites include springs at the following locations:
  - NE¼Section 28, Township 32 North, Range 53 East
  - SW¼NW¼, Section 27, Township 32 North, Range 53 East
  - NE¼SE¼, Section 27, Township 32 North, Range 53 East.
- Reconstruct/maintain Emigrant Spring enclosure for benefit of wildlife.
- Implement reclamation measures that favor establishment of big sagebrush in portions of the site. Special measures would be coordinated with BLM and NDOW to control soil loss associated with big sagebrush planting.

RESIDUAL ADVERSE EFFECTS

Species composition and structure of reclaimed habitat may over the long-term (decades) be sub-optimal for wildlife species dependent on sagebrush and other shrubs because of reduced densities of big sagebrush and other shrubs. Also, sagebrush and other woody plants take longer to mature and attain maximum productivity and vigor than herbaceous species.

RECREATION

SUMMARY

The Emigrant Project would result in 3,687 fewer acres available for recreational activities during operation and after cessation of mining until reclamation is complete. The Project would bisect the Tonka Creek road precluding continuous or "loop" travel through the area during active mining operations. Upon completion of mining the road segment would be reconstructed and relocated to connect with the existing route and re-establish "loop" travel through the area. Most of the work force for facility construction and mining would be drawn from the local labor pool; consequently, impacts to existing campgrounds and other area recreational opportunities are expected to be minimal relative to existing conditions.

DIRECT AND INDIRECT IMPACTS

PROPOSED ACTION

The Emigrant Project would result in incremental withdrawal of up to 3,687 acres from recreational access and use. This area would lie within the boundary fence shown on **Figure 2-2**. This area would not be available for recreation until mining and reclamation are completed. Consequently, public access would be restricted for safety and security reasons. In addition, land within the proposed project vicinity does not offer unique outdoor recreation opportunities. Portions of the Study Area outside of the Carlin Trend active mining district, including land within BLM's Elko District contains large areas of similar land available to the public for dispersed recreation.

Regional recreation opportunities, including campgrounds and other facilities, would be minimally impacted. The Project would bisect the Tonka Creek road precluding continuous or "loop" travel through the area during active mining operations. Upon completion of mining the road segment would be reconstructed and relocated to connect with the existing route and re-establish "loop" travel through the area. During the life of the Emigrant Project and prior to completion of reclamation, the area within the fenced boundary of the mine site would be unavailable for hunting.

NO ACTION ALTERNATIVE

Under the No Action Alternative, no additional disturbance to private or public land or direct impacts to recreation resources would occur. Impacts from previously authorized activities would continue under the No Action Alternative.

CUMULATIVE EFFECTS

The cumulative impacts area evaluated for recreation and wilderness values includes northeastern Nevada. The gradual but continuous expansion of mining activities along the Carlin Trend would result in less area available for dispersed recreational activity. Any increase in population associated with expanding mining activity would result in more demand for recreation on public land.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Newmont has developed a reclamation plan in accordance with BLM and NDEP regulations to address disturbances associated with the

Emigrant Project. Objectives for reclamation are to support post-mining land use, including dispersed recreation activities. Pre-mining land uses are expected to resume.

No irretrievable or irreversible impacts to recreational uses within the Study Area are expected as a result of the proposed Project.

POTENTIAL MONITORING AND MITIGATION MEASURES

MITIGATION

- Install four game guzzlers.
- Install five interpretive signs at South Fork Canyon Special Recreation Management Area.

RESIDUAL ADVERSE EFFECTS

Residual effects on recreation resources may include withdrawal of land not reclaimed for future recreation opportunities or enhancements. The Proposed Action adds to the number of disturbed acreage in the vicinity; however, all but about 98 acres of the total disturbance would be reclaimed.

GRAZING MANAGEMENT

SUMMARY

Implementation of the Emigrant Project would result in the loss of 285 Animal Unit Months (AUMs) in Emigrant Springs Allotment No. 5417. There would be no reduction of AUMs in Tonka Allotment No 5468. Carrying capacity of the allotment would be reduced until reclamation of disturbed areas is complete and vegetation established. Alternative water sources would be developed to compensate for losses incurred from mining activity.

DIRECT AND INDIRECT IMPACTS

PROPOSED ACTION

Grazing capacity would be reduced by incremental withdrawal of up to 3,269 acres from the Emigrant Springs Allotment No. 5417 and 100 acres from the Tonka Allotment No. 5468. Withdrawal of these areas would likely occur in two phases corresponding to relocation of the mine perimeter fence as shown on **Figure 2-2**. Areas withdrawn from allotments and pastures affected by development of the Emigrant Project are shown in **Table 4-7.**

TABLE 4-7
Grazing Allotments Affected by Proposed Permit Boundary

Pasture	Phase I		Phase II		Total	
	Acres	Public AUMs	Acres	Public AUMs	Acres	Public AUMs
Emigrant Springs Allotment No. 5417						
Crawford Mtn Pasture	2,050	238	504	47	2,554	285
Scott Seeding North	701		-0-	-0-	701	
Brush Corral FFR	14		-0-	-0-	14	
Subtotal	**2,765**	**238**	**504**	**47**	**3,269**	**285**
Tonka Allotment No. 5468						
Tonka Pasture	-0-	-0-	100	-0-	100	-0-
Total	**2,765**	**238**	**604**	**47**	**3,369**	**285**

FFR = Federal Fenced Range; AUM = animal unit month.
Source: Spence 2005.

Grazing capacity would be reduced by withdrawal of 3,269 acres representing 285 AUMs in Emigrant Springs Allotment No. 5417. Approximately 98 acres of open pit would not be reclaimed resulting in a permanent loss of 7 AUMs in the Crawford Mountain pasture. There would be no reduction of AUMs in Tonka Allotment No 5468. Carrying capacity of the Emigrant Springs Allotment would be reduced until reclamation is complete and vegetation re-established on disturbed areas. Implementation of the Proposed Action would result in withdrawal of 2,554 acres from the Crawford Mountain pasture, 701 acres in the North Scott Seeding Federal Fenced Range pasture, and 14 acres in the Brush Corral Federal Fenced Range pasture.

NO ACTION ALTERNATIVE

Implementation of the No Action Alternative would not impact current grazing practices or range resources in the Project Area. No disturbance to soil or vegetation would occur and current stocking rates would continue as permitted. Impacts from previously authorized activities would continue under the No Action Alternative.

CUMULATIVE EFFECTS

Activities that result in land disturbance on public land would be subject to BLM reclamation requirements. As activities that reduce the number of AUMs that can be accommodated in any specific allotment for a period of time, land reclamation would also restore the allotment carrying capacity.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Grazing capacity on mine-related disturbance areas would be lost until reclamation is completed and vegetation becomes established. Approximately 98 acres of open pit would not be reclaimed resulting in an irreversible and irretrievable loss of seven AUMs in the Crawford Mountain pasture.

POTENTIAL MONITORING AND MITIGATION MEASURES

MITIGATION

- Construct trough and pipeline system on east side;
- Develop two springs within the Project Area and pipe the water outside the enclosure fence;
- Develop spring/spring complexes proposed for fencing in wildlife/fisheries sections (Sections 27 and 28, Township 32N, Range 53E) to provide water for livestock, if feasible; and
- Maintain east side cattle corridor.

RESIDUAL ADVERSE EFFECTS

Residual adverse effects would remain in approximately 98 acres of open pit which would not be reclaimed.

ACCESS AND LAND USE

SUMMARY

The Emigrant Project would bisect the Tonka Creek road precluding continuous or "loop" travel through the area during active mining operations Upon completion of mining the road segment would be reconstructed and relocated to connect with the existing route and re-establish "loop" travel through the area.

DIRECT AND INDIRECT IMPACTS

PROPOSED ACTION

Access

Development of the Emigrant Project would bisect the Tonka Creek road, which passes through the area. This route extends from the Newmont Rain road through the proposed mine area into the Dixie Creek drainage basin and would effectively preclude continuous or "loop" travel through the area during mining operations. Numerous two-track roads provide access throughout the area to support livestock grazing operations and public access for recreational purposes.

A 12-inch diameter water pipeline, overhead powerline, and access road associate with right-of-way N-47282 would be relocated around the proposed heap leach facility in portions of Sections 1, 2 and 12, Township 31 North, Range 53 East. Right-of-way N-47290 would not be affected by proposed mine operations.

Land Use

Potential impacts to Land Use would be the same as those described under *Recreation* and *Grazing Management* sections of this chapter.

NO ACTION ALTERNATIVE

The No Action Alternative would result in no additional impacts to land use and access. Impacts from previously authorized activities would continue under the No Action Alternative.

CUMULATIVE EFFECTS

The cumulative impacts geographic area evaluated for land use and access encompasses roads and public land access in and adjacent to the Carlin Trend extending from the Emigrant Project Area to the Hollister Mine. As mining continues to develop along the Carlin Trend, more land would be removed from public access for use by mining activities. Water uses would be affected where mine dewatering causes significant changes in groundwater levels, surface water flow, and/or water quality.

Reclamation of land surface disturbed by mining to post-mining land uses would eventually result in reestablishing land use and access similar to pre-mining levels.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Pre-mine land uses including wildlife habitat, dispersed recreation, and grazing, are expected to resume following reclamation.

POTENTIAL MONITORING AND MITIGATION MEASURES

MITIGATION

- ➤ Fence wetlands and riparian areas within and adjacent to the proposed mine-disturbance area to reduce effects of livestock on vegetation and streambanks. Construct spring boxes and water troughs if warranted. Sites include springs at the following locations:

  - NE¼Section 28, Township 32 North, Range 53 East
  - SW¼NW¼, Section 27, Township 32 North, Range 53 East
  - NE¼SE¼, Section 27, Township 32 North, Range 53 East.

- ➤ Construct water trough and pipeline system on east side of Project Area.

- ➤ Maintain east side cattle corridor.

RESIDUAL ADVERSE EFFECTS

No residual adverse effects to land use activities are expected following reclamation of the Emigrant Project Area.

NOISE

SUMMARY

Noise generated by the Proposed Action would vary during construction, mining, and reclamation activities. Although no residences are located within a 5-mile radius of the Project, the area is rural and home to numerous wildlife species, therefore, the EPA L_{dn} 55 dBA criteria (EPA 1979) was used to evaluate the Project noise levels.

Short-term noise levels during construction and reclamation activities are predicted to be L_{dn} 55 dBA at 0.25 miles from the Project Area, which meets the EPA guideline of L_{dn} 55 dBA. Therefore, the short-term noise levels during construction and reclamation activities are not predicted to be significant beyond a 0.25-mile radius.

Long-term noise levels during mining operations, including work at the open pit, waste rock disposal and heap leaching facilities, is predicted to be L_{dn} 56 dBA at 0.5 miles and L_{dn} 50 dBA at one mile from the Project Area. Therefore, the EPA L_{dn} 55 dBA guideline is predicted to be met at approximately 0.6 miles beyond the Project Area, and the long-term noise during mining activities is not predicted to be significant beyond a 0.6-mile radius. No increase in noise levels is anticipated for the No Action Alternative.

DIRECT AND INDIRECT IMPACTS

PROPOSED ACTION

Project equipment used for the construction, mining, and/or reclamation activities will include drill rigs, end-dump trucks, front-end loaders, shovels, and other standard construction and earth moving equipment. Each individual piece of construction and earth-moving equipment can typically generate intermittent noise levels up to 90 dBA at a distance of 50 feet from the equipment (USDOT 1995). However, equipment noise can vary considerably depending on age, condition, manufacturer, use during a time period, and a changing distance from the equipment to a listener location. In addition, the mine will utilize down-hole blasting for the open pit operations. **Table 4-8** indicates the estimated Proposed Action noise levels per activity at varying distances from the source(s).

Short-term noise levels during construction and reclamation activities are predicted to be L_{dn} 55 dBA at 0.25 miles from the Project Area (**Table 4-8**), which meets the EPA guideline of L_{dn} 55 dBA. Therefore, the short-term noise levels during construction and reclamation activities are not predicted to be significant beyond a 0.25-mile radius.

Long-term noise levels during the mining operations, including work at the open pit, waste rock disposal and heap leaching facilities, is predicted to be L_{dn} 56 dBA at 0.5 miles and Ldn 50 dBA at 1 mile from the Project Area (**Table 4-8**). Therefore, the EPA L_{dn} 55 dBA guideline is predicted to be met at approximately 0.6 miles beyond the Project Area, and the long-term noise during mining activities is not predicted to be significant beyond a 0.6-mile radius.

Blasting noise was evaluated separately from the other mine operations because the intermittent and brief occurrence would not significantly affect the L_{dn} value. Although the predicted peak blasting noise level of approximately 120 dBC at 0.25 miles from the Project Area (**Table 4-8**) is less than the U.S. Army guideline for human annoyance of 122 dBC, the blast noise could be audible at many locations within approximately a 5-mile radius.

TABLE 4-8
Estimated Noise Levels at Various Distances from Source(s)
Emigrant Project

Proposed Action	Equipment / Noise Source(s)	Noise Level at Receiver		
		¼ mile	½ mile	1 mile
Construction — • Heap leaching facility • Diversion channel • Haul and access roads • Ancillary facilities	Three pieces of earth moving equipment operating simultaneously, such as end-dump trucks, bulldozers, scrapers, front-end loaders, graders, etc.	L_{dn} 55 dBA	L_{dn} 49 dBA	L_{dn} 46 dBA
Operations — • Open pit mine • Waste rock disposal • Heap leaching facility	Sixteen pieces of earth moving equipment operating simultaneously, including end-dump trucks, front-end loaders, shovels, etc.	L_{dn} 62 dBA	L_{dn} 56 dBA	L_{dn} 50 dBA
Operations — • Open pit mine	Blasting – 10 charges of 375 lb explosives detonated simultaneously.	120 dBC (peak)	114 dBC (peak)	108 dBC[1] (peak)
Reclamation — • All areas	Three pieces of earth moving equipment operating simultaneously, including end-dump trucks, bulldozers, scrapers, front-end loaders, graders, etc.	L_{dn} 55 dBA	L_{dn} 49 dBA	L_{dn} 46 dBA

Note: [1] Blast noise potentially audible for several miles.
Source: USDOT 1995; Greene and Greene 1997.

NO ACTION ALTERNATIVE

Under the No Action Alternative, impacts from noise would not change from current levels. Impacts from previously authorized activities would continue under the No Action Alternative.

CUMULATIVE EFFECTS

Other noise sources located within a 5-mile radius of the Proposed Action include a landing strip located 2.5 miles to the south. As noted in **Table 4-8**, noise levels estimated for the Proposed Action are not predicted to exceed the EPA L_{dn} 55 dBA criteria at areas beyond a 1-mile radius. Since the other major noise sources are located greater than two miles from the Proposed Action, cumulative noise effects are not predicted to significantly increase the ambient noise levels beyond a 1-mile radius.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

No resource would be irreversibly or irretrievably impacted by noise generated from the Emigrant Project.

POTENTIAL MONITORING AND MITIGATION MEASURES

No monitoring or mitigation measures for noise have been identified by BLM.

RESIDUAL ADVERSE EFFECTS

There would be no residual adverse effects on the environment from the noise generated during mining and ore-processing operations. When mining activity ceases, anthropogenic noise would be reduced to low levels associated with reclamation (recontouring and seeding) and then cease altogether.

VISUAL RESOURCES

SUMMARY

Visual impacts of the Proposed Action and Alternatives were analyzed using procedures set forth in the Visual Resource Contrast Rating Handbook (BLM 1986). Terraced, flat-topped waste rock piles and rock faces would present moderate to strong contrasts with the existing landform and line of steep canyons and gentle slopes. The moderate to strong form contrasts would impact visual resources in a localized manner. Views of the majority of mining activities would be hidden from view by canyon walls and higher ridge land forms to the south and east. The color and texture of the reclaimed area would be a moderate contrast to the existing landscape. Reclamation of disturbed areas would meet Class IV VRM objectives.

DIRECT AND INDIRECT IMPACTS

PROPOSED ACTION

Major changes in the landscape would accompany mining practices at the proposed Emigrant Project. Terraced, flat-topped waste rock piles and rock faces would present moderate to strong contrasts with the existing landform and line of steep canyons and gentle slopes. Moderate to strong form contrasts would impact visual resources in a localized manner. Views of the majority of mining activities would be hidden from view by canyon walls and higher ridge land forms to the south and east. The color and texture of the reclaimed area would be a moderate contrast to the existing landscape. The disturbed soils, associated with the mining activities are not expected to be highly contrasted with the undisturbed soil color. The reclamation activities would include shaping the edges of the disturbance areas to blend in with the surrounding land forms and revegetation. Class IV VRM objectives would be met by the proposed reclamation.

NO ACTION ALTERNATIVE

Under the No Action Alternative, no visual impacts would occur at the Emigrant Project beyond those already present.

CUMULATIVE EFFECTS

Reclamation measures are required and would occur on current and future mining activities in the Carlin Trend. However, major elements of certain mining facilities would remain, including pit highwalls and earth-fill structures. Visual contrasts in form, line, and color would remain in the post-mining landscape.

VRM Class IV allows management activities that result in major modification to the character of the landscape. Impacts on visual resources from reasonably foreseeable mining activities can be minimized, but not eliminated, through reclamation measures. To continue to meet VRM Class IV objectives, all feasible measures should be taken to minimize visual impacts.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

An irretrievable commitment of visual resources would occur during construction and active mining period until reclamation is successful. Impacts on visual resources would

be reduced through implementation of reclamation and mitigation measures. Unreclaimed rock faces would represent an irreversible commitment of resources.

POTENTIAL MONITORING AND MITIGATION MEASURES

No monitoring or mitigation measures for visual resources have been identified by BLM.

RESIDUAL ADVERSE EFFECTS

Following successful reclamation, the waste rock disposal facility would be the most noticeable residual adverse effect of the Proposed Action. Weak contrasts in form, line and color could remain. Weak contrasts would result from the prismoidal forms and straight lines of the reclaimed waste rock disposal embankments. Finer and more uniform soil in this area would also create weak contrasts in texture with the existing landscape.

CULTURAL RESOURCES

SUMMARY

Forty-three cultural resources are located within the Area of Potential Effect (APE). Of these, three prehistoric period resources (CrNV-01-13259, -13261, and -13272) have been determined eligible to the National Register based on Criterion D. These sites are located within the proposed oxide heap leach facility and would be impacted during construction of that facility. If avoidance is not possible, impacts to the three properties could be determined to have "no adverse effect" if a data recovery plan is prepared, approved by BLM in consultation with the Nevada State Historic Preservation Office, and subsequently implemented.

DIRECT AND INDIRECT IMPACTS

PROPOSED ACTION

Identified cultural resources present in the Proposed Disturbance Boundary are shown in **Table 3-26**. Forty-two cultural resources are located within the APE. Of these, three prehistoric period resources (CrNV-12-13259, 13261, and 13272) have been determined eligible to the National Register based on Criterion D. All three resources are located within the proposed oxide heap leach facility and would be impacted during construction of that facility. Impacts to those properties could be determined to have "no effect" if the project design was modified so as to avoid any impact to the resource. This would require that an acceptable disturbance-free buffer be defined around each avoided National Eligible property. If avoidance is not possible, impacts to the three properties could be determined to have "no adverse effect" if a data recovery plan is prepared, approved by BLM in consultation with the Nevada State Historic Preservation Office, and subsequently implemented.

Resources present outside the Proposed Disturbance Boundary but within the Permit Boundary are listed in **Table 3-29**. Of the 47 recorded in this area, nine (CrNV-12-11043, 13254, 13255, 13258, 13260, 13264, 13265, 13269, and 13270) are eligible for listing on the National Register of Historic Places. Because

these resources are eligible based on Criterion D, it is unlikely that they will be impacted due to the introduction of visual or audible intrusions. They may be subject to indirect impacts due to increased access and visibility may result in increased vandalism.

NO ACTION ALTERNATIVE

There would be no direct effect on National Register eligible sites under the No Action Alternative. Impacts from previously authorized activities would continue under the No Action Alternative.

CUMULATIVE EFFECTS

Activities associated with the Emigrant Project would result in restricted public access into the Project Area during the operational life of the mine.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

The Proposed Action would result in the loss of cultural resources that are not National Register eligible. The loss of these sites would constitute an irreversible and an irretrievable commitment of a resource. These sites have been recorded to current BLM standards and the site information has been integrated into agency and statewide data repositories.

Impacts to National Register eligible properties would be reduced through preparation and implementation of data recovery and/or mitigation plans. However, their information potential cannot be retrieved fully. As a result, post-treatment impacts to these properties as a result of the Proposed Action would result in an irreversible and an irretrievable commitment of a resource. Several of the proposed project elements are fenced. This would limit human activity outside the immediate activity area. This would serve to protect eligible resources located near the proposed facilities. Distance and difficulty of access would serve to protect others.

POTENTIAL MONITORING AND MITIGATION MEASURES

Implementation of the Proposed Action would result in direct impacts to three prehistoric period resources that are National Register eligible.

MITIGATION

- Unless otherwise authorized by BLM, no surface disturbance shall occur within or immediately adjacent to (within 100 feet) the boundary of sites CrNV-01-13259, -13261, or –13272 prior to completion of the field phase of the data recovery plan reviewed and approved by BLM and the Nevada State Historic Preservation Office.

RESIDUAL ADVERSE EFFECTS

Data recovery activities could occur at three National Register eligible, prehistoric properties. Even after implementation of data recovery activities, non-renewable resources would have been expended. This represents a direct and a residual effect of the Proposed Action.

NATIVE AMERICAN CONCERNS

SUMMARY

Implementation of protective measures by the proponent (compliance with all applicable state and federal design parameters) is expected to reduce impacts resulting from the Proposed Action.

DIRECT AND INDIRECT IMPACTS

PROPOSED ACTION

Collection of information from Native Americans is ongoing. Based on comments received to date, the Proposed Action could have the following impact, identified as an area of Native American concern:

An un-named intermittent stream course would be relocated to accommodate construction of the proposed Emigrant pit. Quality of water (increased sediment and/or temperature) in the diversion channel could be affected. Information contained in the EIS allows the BLM to address this concern. Protective measures proposed by Newmont (compliance with all applicable state and federal design parameters; implementation of BMPs) are expected to reduce impacts resulting from the Proposed Action.

As more resource information becomes available (through the on-going consultation process), and given comments received during public and agency review of the Draft EIS, it may be possible to further refine this discussion. Any such modifications would be contained in the Final EIS and would be subject to Section 106 consultation.

NO ACTION ALTERNATIVE

Selection of the No Action Alternative would result in no further direct or indirect impacts on Native American religious or traditional values, practices, properties, human remains, or cultural items. Impacts from previously authorized activities would continue under the No Action Alternative.

CUMULATIVE EFFECTS

Some Western Shoshone have expressed a concern that cumulative impacts may occur to their spiritual life and cosmology. The Proposed Action would potentially impact stream flow, vegetation patterns and wildlife distribution. Such changes, individually and collectively, could impact the integrity of power spots, disrupt the flow of spiritual power (*Puha*), and cause the displacement of spirits (e.g., little men and water babies). Any such impact would limit the potential of Western Shoshone to participate in traditional religious activities.

Given that specific religious or traditional values, practices, human remains, or cultural items were not identified by the Western Shoshone in the Project Area, BLM has determined the potential for a cumulative impact to Native American traditional values is minimal.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

No irreversible or irretrievable commitment of resources associated with Native American Concerns has been identified.

POTENTIAL MONITORING AND MITIGATION MEASURES

No direct or indirect effects to known Western Shoshone traditional cultural values, practices, properties, or human remains are anticipated in the Emigrant Project Area as a result of the Proposed Action. Therefore, mitigation and monitoring measures are not proposed at this time. However, if impacts to any unknown (at the time of the writing of the EIS and prior to any authorized mining activity) Traditional Cultural Properties or sites of cultural/spiritual/traditional use occur, mitigation and monitoring measures would be addressed on a site specific basis.

A natural design for the new diversion channel (to include roughness features, step pools, and substrates for vegetation establishment as applicable) through the proposed mine pit would be provided. For further details refer to *Water Quantity and Quality* section of this chapter.

Any cultural properties, items, or artifacts (i.e. stone tools, projectile points, etc.) encountered during mining or reclamation activities, shall not to be collected. Cultural and archeological resources are protected under the Archeological Resources Protection Act (16 U.S.C. 470ii) and Federal Land Management Policy Act (43 U.S.C. 1701).

Although the possibility of disturbing Native American gravesites within the Project Area is low, the procedure for handling an inadvertent discovery must be noted. Under the Native American Graves Protection and Repatriation Act, section (3)(d)(1), the discovering individual must notify the land manager in writing of such a discovery. If discovery occurs in connection with an authorized land use, the activity causing the discovery shall cease and materials protected until the land manager can respond to the situation.

RESIDUAL ADVERSE EFFECTS

No residual adverse impacts to Native American Concerns have been identified.

SOCIAL AND ECONOMIC RESOURCES

SUMMARY

The Emigrant Project would employ approximately 180 people. Most of the work force for the Project would be from existing mine-related work forces in the Carlin Trend. The initial construction work force for the Emigrant Project would be approximately 100 people decreasing to about five employees at the end of construction. Construction and development are expected to require approximately 12 months.

The Proposed Action would create positive impacts through continued employment in the mining industry and indirect employment in the retail and service sectors. Property and net proceeds of mining taxes paid by Newmont for the Emigrant Project collected by local and state jurisdictions would also continue. Negative impacts

would be minimal because employees from existing and nearby facilities likely would be used for construction and operation of the facility, thereby extending their work rather than bringing in new workers.

The Emigrant Project would not be approved under the No Action Alternative.

DIRECT AND INDIRECT IMPACTS

PROPOSED ACTION

Newmont employs 1,600 people in Elko County and would employ approximately 180 people at the Emigrant Project. Most of the work force for the Project would be from existing mine-related work forces in the Carlin Trend. The initial construction work force for the Emigrant Project would be approximately 100 people decreasing to about five employees at the end of construction. Construction and development are expected to require approximately 12 months. The Proposed Action, together with other Newmont activities, would provide for long term operations in the area, with consequent potential for stable employment levels for approximately 15 years. Since it is expected that few new employees from outside the area would be needed for the construction and operation activities, few people are expected to move into the area. Therefore, negative impacts to socioeconomic resources would be minimal.

During the operational phases of the project, economic impacts would include continued employment in the mining industry and secondary jobs in retail and service sectors. All the property taxes and net proceeds of the mining taxes, as well as sales taxes would be paid to Elko County. Continued mine employment at the Emigrant Project would positively affect quality-of-life for workers and their families.

NO ACTION ALTERNATIVE

Under the No Action alternative impacts to social and economic resources would remain at existing levels. Impacts from previously authorized activities would continue under the No Action Alternative.

CUMULATIVE EFFECTS

Implementation of the Proposed Action would provide steady employment for approximately 15 years.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

No irreversible and irretrievable commitment of socioeconomic resources has been identified as a result of the Emigrant Project.

POTENTIAL MONITORING AND MITIGATION MEASURES

Potential economic impacts have been identified as being minimal. No mitigation or monitoring measures have been identified for this resource.

RESIDUAL ADVERSE EFFECTS

No residual adverse effects to the socioeconomic resources are expected.

ENVIRONMENTAL JUSTICE

SUMMARY

Direct and indirect impacts associated with the Proposed Action would not have a disproportionate affect on minority populations.

DIRECT AND INDIRECT IMPACTS

PROPOSED ACTION

Direct and indirect impacts associated with the Proposed Action would not have a disproportionate affect on minority populations in the Study Area.

Census data for 2000 were reviewed to determine if disproportionately high minority and low-income populations are present within an assessment area defined to surround the location of the Proposed Action. Review of Census Tract 9516 indicates that census blocks located in and around the Emigrant Project are not populated and do not contain representatives of a minority population or a population living below the poverty level. As a result, the Proposed Action would not have potential to disproportionately impact a minority or low-income population.

NO ACTION ALTERNATIVE

Impacts relating to environmental justice would not occur under the No Action Alternative. Impacts from previously authorized activities would continue under the No Action Alternative.

CUMULATIVE EFFECTS

There would be no cumulative impacts to environmental justice as a result of the Proposed Action.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

There would be no irreversible or irretrievable environmental justice impacts as a result of the Proposed Action.

POTENTIAL MONITORING AND MITIGATION MEASURES

Monitoring and mitigation measures for environmental justice have not been identified by BLM.

RESIDUAL ADVERSE EFFECTS

Implementation of the Proposed Action would not result in residual adverse environmental justice effects.

CHAPTER 5

CONSULTATION, COORDINATION, AND PREPARATION

PUBLIC PARTICIPATION

SUMMARY

Public participation specific to the Emigrant Project (Project) is summarized in this chapter. The summary indicates how the public has been involved, identifies persons and organizations to be contacted for feedback, and specifies time frames for accomplishing goals in accordance with 40 CFR 1506.6.

Public involvement in the EIS process includes the necessary steps to identify and address public concerns and needs. The public involvement process assists the agencies in: (1) broadening the information base for decision making; (2) informing the public about the Proposed Actions and the potential long-term impacts that could result from the projects; and (3) ensuring that public needs are understood by the agencies.

Public participation in the EIS process is required by NEPA at four specific points: the scoping period, review of Draft EIS, review of Final EIS, and receipt of the Records of Decision.

- **Scoping:** The public is provided a 30-day scoping period to disclose potential issues and concerns associated with the Proposed Action. Information obtained by the agencies during public scoping is combined with issues identified by the agencies and this forms the scope of the EIS.
- **Draft EIS Review:** A 60-day Draft EIS review period is initiated by publication of the Notice of Availability for the Draft EIS in the Federal Register. A public hearing will be held in Elko, Nevada during the 60-day comment period.
- **Final EIS Review:** A 30-day Final EIS review period is initiated by publication of the Notice of Availability for the Final EIS in the Federal Register.
- **Record of Decision:** Subsequent to the 30-day review period for the Final EIS, a Record of Decision would be prepared.

Tribal Communication and Coordination

Communication and coordination with local tribes is addressed in the *Native American Concerns* section of Chapter 3.

IMPLEMENTATION

The public participation process for the Project EIS is comprised of the following five components:

1. PUBLIC SCOPING PERIOD AND MEETINGS

To allow an early and open process for determining the scope of issues and concerns related to the Proposed Action (40 CFR 1510.7), a public scoping period was provided by BLM. A Notice of Intent to prepare the EIS was published in the Federal Register (Volume

69, Number 101 ppg. 29744-29745) on May 25, 2004, (NV-910-04-1990-EX). Publication of this notice in the Federal Register initiated a 30-day public scoping period for the Proposed Action that ended on July 7, 2004.

BLM mailed a scoping package that included a project summary and maps to individuals and organizations listed on the Elko Field Office mailing list. In addition, the scoping package was distributed at public scoping meetings. The Plan of Operations was provided on request.

Concurrent with these actions, BLM issued a news release to radio stations and news organizations with coverage in the surrounding geographical regions in Nevada, Idaho, and Utah.

A public scoping meeting was held by BLM in Elko on June 16, 2004. Separate meetings were held for the Elko and Eureka County Commissioners. Thirty-two members of the public attended, of which six submitted written comments on the Project. Written responses were received from nine individuals during the public scoping period.

2. DISTRIBUTION OF THE DRAFT EIS

The Draft EIS will be distributed as follows:

- A Notice of Availability will be published in the Federal Register specifying dates for the comment period and the date, time, and location of a public meeting.
- A news release provided to all area media by BLM at the beginning of the 60-day comment period on the Draft EIS.
- The Draft EIS will be distributed to interested parties identified in the updated EIS mailing list.
- The Draft EIS will be posted on the BLM Elko Field Office website.
- A public open-house meeting will be held in Elko, Nevada to obtain comments on the Draft EIS and answer questions that the public has regarding the Project or the EIS process.

3. FINAL EIS DISTRIBUTION

The Final EIS will be distributed as follows:

- Notice of Availability will be published in the Federal Register.
- Copies of the Full Text Final EIS or Abbreviated Final EIS will be sent to addresses on the mailing list.
- The Final EIS will be posted on the BLM Elko Field Office website.
- A news release issued to the same news outlets used for previous Project announcements.

4. RECORD OF DECISION

A Record of Decision will be distributed by BLM to individuals and organizations identified on the updated Project mailing list. A news release will be provided to the news media. A notice of availability (NOA) will be published in the Federal Register.

CRITERIA AND METHODS BY WHICH PUBLIC INPUT IS EVALUATED

Letters and oral comments received by BLM on the Draft EIS will be reviewed and evaluated by the agency to determine if information provided in the comments would require a formal response or contains new data that may identify

deficiencies in the EIS. Steps will then be initiated to correct such deficiencies and to incorporate information into the Final EIS.

CONSULTATION WITH OTHERS

In addition to the cooperating agencies identified in Chapter 1, the following state and federal agencies and other entities were consulted during preparation of the EIS:

- Nevada Department of Conservation and Natural Resources
- Nevada Department of Human Resources
- US Fish and Wildlife Service
- Nevada State Clearinghouse
- Tomera Ranches
- Te-Moak Tribe Environmental Department

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Cultural Resources – Bryan Hockett
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CONTRIBUTING AUTHORS

The following individuals contributed to the Cumulative Effects analysis for *Wildlife Resources* and *Special Status Wildlife Species* sections of this Draft EIS.

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MAILING LIST –EMIGRANT PROJECT

The Emigrant Project Draft EIS was mailed to approximately 300 agencies and individuals.

CHAPTER 6

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APPENDIX A

Water Quality Standards and Data for South Fork Humboldt River

TABLE A-1
Water Quality Criteria and Standards for Nevada

Parameter (mg/L, unless otherwise specified) [1]	Federal Drinking Water Standard		Nevada Municipal or Domestic Supply	Nevada Aquatic Life [3]		Nevada Agriculture		Wildlife Propagation
	Primary MCL [2]	Secondary MCL [2]		1-Hour Ave. or Propagation	96-Hour Ave. or Put & Take	Irrigation	Stock Water	
Metals								
Aluminum	---	0.05 – 0.2	---	---	---	---	---	---
Antimony	0.006	---	0.146	---	---	---	---	---
Arsenic	0.01*	---	0.05	0.342 As(III)	0.18 As(III)	0.1	0.2	---
Barium	2.0	---	2.0	---	---	---	---	---
Beryllium	0.004	---	0	---	---	0.1	---	---
Boron	---	---	---	---	---	0.75	5.0	---
Cadmium	0.005	---	0.005	0.0053 [4]	0.0013 [4]	0.01	0.05	---
Chromium	0.10	---	0.10	0.015 Cr(VI)	0.01 Cr(VI)	0.1	1.0	---
Copper	1.3	1.0	---	0.0221 [4]	0.0142 [4]	0.2	0.5	---
Iron	---	0.3	---	1.0	1.0	5.0	---	---
Lead	0.015	---	0.05	0.0684 [4]	0.0013 [4]	5.0	0.1	---
Manganese	---	0.05	---	---	---	0.2	---	---
Mercury	0.002	---	0.002	0.002	0.000012	---	0.01	---
Molybdenum	---	---	---	0.019	0.019	---	---	---
Nickel	---	---	0.0134	1.699 [4]	0.189 [4]	0.2	---	---
Selenium	0.05	---	0.05	0.02	0.005	0.02	0.05	---
Silver	---	0.1	---	0.0069 [4]	0.0069 [4]	---	---	---
Thallium	0.002	---	0.013	---	---	---	---	---
Zinc	---	5.0	---	0.140 [4]	0.127 [4]	2.0	25	---
General Parameters, Common Ions, & Nutrients								
Cyanide (free)	0.2	---	0.2	0.022	0.0052	---	---	---
Alkalinity	---	---	---	<25% change		---	---	30 – 130
Chloride	---	250	250	---	---	---	1,500	1,500
Color (PCU)	---	15	75	---	---	---	---	---
Dissolved Oxygen	---	---	Aerobic	5.0	5.0	---	Aerobic	Aerobic
Fluoride	4.0	2.0	---	---	---	1.0	2.0	---
Nitrate as N	10	---	10	90(w)	90(w)	---	100	100
Phosphorus, total as P	---	---	---	0.1 [5]	---	---	---	---
pH (su)	---	6.5 – 8.5	5.0 – 9.0	6.5 – 9.0	6.5 – 9.0	4.5 – 9.0	5.0 – 9.0	7.0 – 9.2
Sulfate	---	250	250	---	---	---	---	---
Temp (°C)	---	---	---	T ≤2°C [5]	Site-specific	---	---	---
TDS	---	500	500	---	---	---	3,000	---
TSS	---	---	---	25 – 80	25 – 80	---	---	---
Turbidity (NTU)	1.0	---	---	50(w); 10(c)	50(w); 10(c)	---	---	---

Source: Nevada Administrative Code 445A.199 & 144; 40 CFR Parts 141 & 143.

[1] mg/L = milligrams per liter; PCU = photoelectric color units; SU = standard pH units; NTU = nephelometric turbidity units; TDS = total dissolved solids; TSS = total suspended solids; °C = degrees Celsius. WAD = weak acid dissociable. Standards for metals are expressed as total recoverable, except those metals that are hardness-dependent where the standard applies to the dissolved fraction (see note #4 below).

[2] MCL = Maximum Contaminant Level (Federal Drinking Water Regulations in 40 CFR Parts 141 & 143).

[3] (w) = warm water; (c) = cold water; no letter designation indicates criteria are common to both warm and cold water.

[4] Parameter dependent on hardness; see NAC 445A.144 for equations to determine concentration; values in this table calculated assuming a hardness of 150 mg/L as $CaCO_3$. Example: Cadmium 1-hour average = 0.85 exp {1.128 in (hardness) – 3.828} = 0.85 exp {1.824} = 0.85 (6.2) = 5.3 μg/L = 0.0053 mg/L.

[5] Standard is for Humboldt River Control Point at Palisade Gage (aquatic life beneficial use), which is approximately 10 air miles downstream of Carlin Gage (NAC 445A.204).

* Current standard is 0.05 mg/l until January 2006 when the enforceable federal drinking water MCL becomes 0.01 mg/l.

TABLE A-2
Water Quality Standards for Class B Streams in Nevada

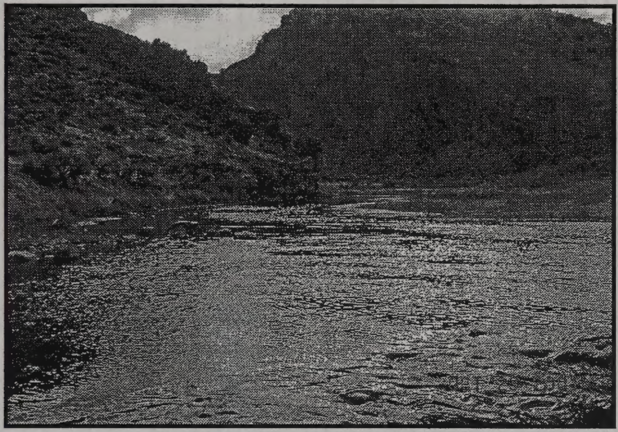
Item	Class B Specification
Floating Solids or Sludge Deposits	Amounts attributable to man's activities that will make the waters unsuitable as a drinking water source, injurious to fish or wildlife, or impair the waters for any beneficial use of this class.
Odor-Producing Substances	Amounts that will impair the palatability of drinking water or fish or have a deleterious effect on fish or wildlife or any beneficial uses of this class.
Sewage, Industrial Wastes, or Other Wastes	None that are not effectively treated to the satisfaction of the NDCNR
Toxic Materials, Oil, Deleterious Substances, Colored or Other Wastes	Such amounts that will render the receiving water injurious to fish or wildlife, or impair the receiving waters for beneficial uses established for this class.
Settleable Solids	See Floating Solids or Sludge Deposits
pH	Range between 6.5 and 8.5
Dissolved Oxygen	For trout water, not less than 6.0 mg/L; for nontrout water, not less than 5.0 mg/L
Temperature	Must not exceed 20° C for trout water or 24° C for nontrout water; allowable temperature increase above natural receiving water temperatures: None
Total Phosphates	Must not exceed 0.3 mg/L
Total Dissolved Solids	Must not exceed 500 mg/L or one-third above that characteristic of natural conditions (whichever is less)

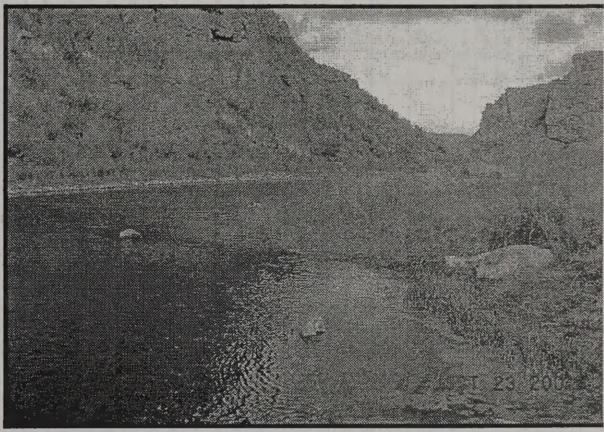
Source: Nevada Administrative Code 445A.124-205.
Note: NDCNR = Nevada Department of Conservation and Natural Resources.

STATE OF NEVADA
SURFACE WATER MONITORING NETWORK

Humboldt River Basin

Stream Name = South Fork Humboldt
Sampling Location Name = South Fork Humboldt below Dixie
Sampling Location ID = HS3A





Sampling Location Description

Standards apply from Lee to its confluence with the Humboldt River. From Elko, NV, travel south on Errecart Blvd. to Bullion Road and turn right. Pass through two cattle guards. At the dead end, turn right and follow the fence to the first cattle guard on your left. Turn left and follow road to the river. Collect samples here.

Beneficial Uses = Irrigation, Watering of livestock, Recreation not involving contact with the water, Recreation involving contact with the water, Industrial supply, Municipal or domestic supply, Propagation of wildlife, Propagation of aquatic life.

Sampling Location = Elko

Hydrologic Unit = 16040103
Latitude 40 44 43 ***Longitude*** 115 51 33
Township 33N ***Range*** 54E ***Section*** 36
Elevation 5000 ft

Data Table (pdf format) *Data Table (Excel xls format)* *NAC Standards for Water Quality*
Metals (pdf format) *Metals (Excel xls format)* *USGS Flow Data*
Return to Humboldt River Basin Map

NEVADA DIVISION OF ENVIRONMENTAL PROTECTION
BUREAU OF WATER QUALITY PLANNING
GRAB/SURFACE WATER SAMPLES
PROVISIONAL RECORDS

C= CALCULATED
O= SAMPLED BUT ANALYSIS NOT PERFORMED
E= ESTIMATE, VALUE LESS THAN THE STATE HEALTH LAB REPORTING LIMIT, TRACKED FROM DEC. 2001 ON

STATION NAME	STATION ID	STORET ID NEW	STORET ID LEGACY	DATE	TIME	TEMP	DISS O2 MG/L	pH FIELD	pH LAB	CONDUCT UM/CM	Q COLOR	COLOR PL-CO	Q CHLORIDE DISS	CHLORIDE DISS MG/L	Q SULFATE DISS	SULFATE DISS MG/L SO4	TDS MG/L	Q TSS	TSS MG/L	Q TURBID	TURBID NTU	Q ALKAL as CaCO3	ALKAL as CaCO3 MG/L
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	8/30/1994	12:10	18.5	10	8	8.2	390		10		13		23	245		12		2		226
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	11/15/1994	16:45	6	6.2	7.72	8.4	423		15		13			261		4		2.2		194
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	2/23/1995	9:00	6	12.1		8.4	379		17		11		17	225		8		2.8		174
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	4/25/1995	8:00	8	9.4		8.3	296		45		9			195		74		50		126
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	6/27/1995	18:30	18	8.5	8.44	8.4	235		35		5			155		21		18		110
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	8/15/1995	15:45	22	12.2		8.7	306		25		8		12	177		3		1		148
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	11/13/1995	14:50	14.5	12.2		8.6	430		15		13			276		8		6		196
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	4/16/1996	15:10	10.5	9.8	8.54	8.4	318		25		9			201		82		28		140
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	6/25/1996	17:00	19	10	8.89	8.7	230		20		6		9	147		4		3.1		114
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	8/28/1996	8:30	14.5	8.1	7.61	8.5	404		17		9		18	234		2		1.8		188
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	10/22/1996	15:45	10	13.8	8.14	8.5	424		12		10		19	247		5		3.2		188
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	2/26/1997	9:50	4	10.8	8	8.3	425		20		16		30	259		120		70		170
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	4/16/1997	14:25	13	12.6	8.99	8.7	341		13		11			204		20		12		146
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	6/18/1997	8:15	14.2	7.8		8.3	226		20		4		7	125		14		11		104
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	8/27/1997	9:00	15.9	10.2	8.17	8.4	323		12		6		12	182		4		4		146
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	10/15/1997	15:35	15	13.6	8.96	8.7	394		5		9		18	220		4		4.7		174
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	12/10/1997	8:10	7.5	7.2	7.93	8.3	517		3		11		22	275		1		1.4		232
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	4/22/1998	8:30	7.8	12.7	8.23	8.2	354		55		10		20	221		140		79		134
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	8/27/1998	9:15	15.8	8.5	8	8.1	390		20		7		15	223		4		1.8		166
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	10/27/1998	9:30	10.1	10.1	8.12						12		21	270		10		2.4		230
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	12/9/1998	9:00	3.9	13.1	8.42	8	433		7		13		17	235		6		4.4		176
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	2/24/1999	9:45	3.5	9.34	8.78	8.39	402		10		10		20	216		18		13.1		154
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	4/21/1999	8:55	7.8	10.78	8.22	8.04	354		45		10		20	226		91		51.2		138
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	6/9/1999	8:30	11.4	9.4	8.45	7.97	324		17		7		12	172		35		14.5		122
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	8/24/1999	17:15	22.2	9.24	8.16	8.07	420		10		10		18	245		5		2.6		192
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	10/27/1999	8:30	11.1	6.25	8.05	7.72	499		5		11		21	246		5		3		210
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	12/15/1999	9:20	6.9	11.21	8.25	7.78	444		7		10		20	248		3		5.3		196
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	2/23/2000	8:40	6	9.59	8.75	7.94	379		7		9		17	208		18		11.4		158
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	4/26/2000	10:00	10.9	10.2	8.51	8.46	372		12		10		18	224		18		11		152
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	6/7/2000	8:50	15	7.9	8.1	8.15	278		15		6		10	152		8		7		120
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	8/23/2000	10:10	17.5	12	8.23	8.43	443		12		9		17	246		6		3.2		198
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	10/17/2000	9:20	9.5	8.7	7.9	8.17	458		7		10		20	248		6		3.2		198
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	12/13/2000	8:50	7	8.7	7.88	8.21	479		7		11		22	268		3		2.2		210
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	2/21/2001	8:55	3.6	8.88	7.73	7.97	351		50		10		17	242		378		550		176
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	4/18/2001	10:00	10.7		8.32	8.42	373		10		9		17	222		22		13		160
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	6/26/2001	8:30	16	8.7	8.64	8.15	417		5		8		18	214		1		0.8		184
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	8/28/2001	10:25	15.9	11.7	8.06	8.25	485		7		10		20	282		4		2.6		210
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	10/23/2001	8:50	12.1	6.9	7.3	8.1	510		5		12		22	250		8		1.8		222
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	12/19/2001	9:10	8.6	9.92	8.2	8.24	500		5		12		23	330	E	2		2		224
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	2/13/2002	8:45	6	10	8	8.32	520		3		12		25	328		16		4.3		240
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	4/17/2002	9:30	7.6	11.52	8.16	8.26	360		10		10		18	214		19		9.4		150
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	8/21/2002	9:30	14.7	8.65	7.8	8.3	480		5		10		21	280	E	1		1.9		218
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	10/22/2002	9:35	11.7	7.62	7.5	8.35	530		5		11		24	268	E	0		1.6		236
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	12/11/2002	8:50	8.8	7.64	8.4	8.24	540		3		12		23	340	E	2		1.7		232
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	3/19/2003	8:40	7.1	7.97	7.99	8.24	430		7		10		19	264	E	2		2.2		184
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	5/14/2003	8:35	10.1	5.01	8.4	8.29	340		15		7		14	188		18		15		142
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	7/30/2003	8:25	15.3	5.99	7.9	8.03	540		7		11		22	342	E	4		1.1		250
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	9/10/2003	8:40	13.2	5.88	7.4	8.14	520		5		10		21	314	E	3		1.8		234
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	11/18/2003	9:00	10.1	5.69	7.6	8.12	500		5		11		22	298	E	2		1.6		232
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	4/14/2004	8:55	7.6	7.96	7.1	8.16	300		10		6		12	176		13		7.8		132

NEVADA DIVISION OF ENVIRONMENTAL PROTECTION
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E= ESTIMATE, VALUE LESS THAN THE STATE HEALTH LAB REPORTING LIMIT, TRACKED FROM DEC. 2001 ON

STATION NAME	STATION ID	STORET ID NEW	STORET ID LEGACY	DATE	TIME	Q ALKAL BICARB as CaCO3	ALKAL BICARB as CaCO3 MG/L	Q BICARB as HCO3	BICARB as HCO3 MG/L	Q ALKAL CARB as CaCO3	ALKAL CARB as CaCO3 MG/L	Q CO3 as CO3	CO3 as CO3 MG/L	Q N TOTAL	N TOTAL MG/L	Q NITRITE as N	NITRITE as N MG/L	Q NITRATE as N	NITRATE as N MG/L	Q NITRATE as NO3	NITRATE as NO3 MG/L	Q N-TOTAL KJELDAHL
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	8/30/1994	12:10		210		256		16		10		0.61	<	0.01		0.19		0.8	
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	11/15/1994	16:45		178		217		16		10		0.46	<	0.01		0.09		0.4	
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	2/23/1995	9:00		158		193		16		10		0.7	<	0.01		0.04		0.2	
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	4/25/1995	8:00		118		144		8		5		1.16		0.01		0.1		0.5	
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	6/27/1995	18:30		94		115		16		10		0.55	<	0.01		0		0.01	
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	8/15/1995	15:45		124		151		24		14		0.52	<	0.01		0.01		0.06	
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	11/13/1995	14:50		172		210		24		14		0.73	<	0.01		0.12		0.5	
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	4/16/1996	15:10		124		151		16		10		0.67	<	0.01		0.06		0.3	
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	6/25/1996	17:00		98		120		16		10		0.35	<	0.01		0.02		0.1	
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	8/28/1996	8:30		164		200		24		14		0.57	<	0.01		0.09		0.4	
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	10/22/1996	15:45		164		200		24		14		0.49	<	0.01		0.07		0.3	
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	2/26/1997	9:50		150		183		20		12		0.68	<	0.01		0.13		0.6	
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	4/16/1997	14:25		122		149		24		14		0.64	<	0.01		0.02		0.08	
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	6/18/1997	8:15		92		112		12		7		0.52	<	0.01		0.03		0.1	
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	8/27/1997	9:00		134		163		12		7		1.09	<	0.01		0.08		0.4	
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	10/15/1997	15:35		154		188		20		12		0.64	<	0.01		0.03		0.1	
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	12/10/1997	8:10		224		273		8		5		0.49	<	0.01		0.22		1	
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	4/22/1998	8:30		134		163		0		0		0.65	<	0.01		0.03		0.1	
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	8/27/1998	9:15		166		203		0		0		0.74	<	0.01		0.07		0.3	
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	10/27/1998	9:30		230		280	<	20	<	12			<	0.1				0.09	
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	12/9/1998	9:00		176		215		0		0		1.13	<	0.01		0.41		1.8	
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	2/24/1999	9:45		142		173		12		7		0.53	<	0.01		0.03		0.13	
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	4/21/1999	8:55		138		168		0		0		0.78	<	0.01		0.04		0.18	
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	6/9/1999	8:30		122		149		0		0		0.59	<	0.01		0.05		0.22	
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	8/24/1999	17:15		192		234		0		0		0.46	<	0.01		0.07		0.31	
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	10/27/1999	8:30		210		256		0		0		0.63	<	0.01		0.17		0.75	
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	12/15/1999	9:20		196		239		0		0		0.76	<	0.01		0.14		0.62	
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	2/23/2000	8:40		158		193		0		0		0.62	<	0.01		0		0	
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	4/26/2000	10:00		144		176		8		5		0.21	<	0.01		0		0	
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	6/7/2000	8:50		120		146		0		0		0.33	<	0.01		0		0	
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	8/23/2000	10:10		186		227		12		7		0.39	<	0.01		0		0	
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	10/17/2000	9:20		198		242		0		0		0.4	<	0.01		0.03		0.13	
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	12/13/2000	8:50		210		256		0		0		0.36	<	0.01		0.13		0.58	
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	2/21/2001	8:55		176		215		0		0		1.87		0.06		0.26		1.15	
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	4/18/2001	10:00		152		185		8		5		0.4	<	0.01		0		0	
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	6/26/2001	8:30		184		224		0		0		0.37	<	0.01		0.02		0.09	
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	8/28/2001	10:25		210		256		0		0		0.35	<	0.01		0.04		0.18	
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	10/23/2001	8:50		222		271		0		0		0.41	<	0.01		0.17		0.75	
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	12/19/2001	9:10		224		273		0		0		0.39	<	0.01		0.17		0.75	
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	2/13/2002	8:45		240		293		0		0		0.4	<	0.01		0.14		0.62	
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	4/17/2002	9:30		150		183		0		0	E	0.51	<	0.01	E	0.03	E	0.13	
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	8/21/2002	9:30		218		266		0		0	E	0.51	<	0.01	E	0.05	E	0.22	
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	10/22/2002	9:35		236		288		0		0	E	0.28	<	0.01	E	0.07	E	0.31	
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	12/11/2002	8:50		232		283		0		0		0.35	<	0.01		0.12		0.53	
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	3/19/2003	8:40		184		224		0		0	E	0.44	<	0.01	E	0.03	E	0.13	
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	5/14/2003	8:35		142		173		0		0	E	0.41	<	0.01	E	0	E	0	
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	7/30/2003	8:25		250		305		0		0		0.47	<	0.01		0.16		0.71	
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	9/10/2003	8:40		234		285		0		0		0.32	<	0.01		0.11		0.49	
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	11/18/2003	9:00		232		283		0		0		0.42	<	0.01		0.21		0.93	
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	4/14/2004	8:55		132		161		0		0		1.01	<	0.01	<	0.5	<	2.22	

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E= ESTIMATE, VALUE LESS THAN THE STATE HEALTH LAB REPORTING LIMIT, TRACKED FROM DEC. 2001 ON

STATION NAME	STATION ID	STORET ID NEW	STORET ID LEGACY	DATE	TIME	N-TOTAL KJELDAHL MG/L	Q N AMMON DISS	N AMMON DISS MG/L N	Q P TOTAL	P TOTAL MG/L	Q Ortho P	Ortho P MG/L P	Q FECAL STREP	FECAL STREP #/100ML	Q FECAL COLI	FECAL COLI #/100ML	Q E COLI	E COLI #/100ML	FLOW CFS	Comments
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	8/30/1994	12:10	0.41	<	0.1		0.03		0.01		40		60		10		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	11/15/1994	16:45	0.36	<	0.1		0.02		0	<	10		20		50		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	2/23/1995	9:00	0.65	<	0.1		0.05		0	<	10	<	10	<	10		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	4/25/1995	8:00	1.05	<	0.1		0.16		0.04		30		40		40		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	6/27/1995	18:30	0.54	<	0.1		0.12		0.04		200		180		200		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	8/15/1995	15:45	0.5	<	0.1		0.07		0.06		10	<	10	<	10		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	11/13/1995	14:50	0.6	<	0.1		0.03		0		30	<	10	<	10		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	4/16/1996	15:10	0.6	<	0.1		0.17		0.03	<	10	<	10	<	10		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	6/25/1996	17:00	0.32	<	0.1		0.07		0.04		40	<	10	<	10		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	8/28/1996	8:30	0.47	<	0.1		0.08		0.08		20				64		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	10/22/1996	15:45	0.42	<	0.1		0.02		0.01		9				10		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	2/26/1997	9:50	0.54	<	0.1		0.06		0.01		10			<	10		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	4/16/1997	14:25	0.61	<	0.1		0.04		0.01	<	10			<	10		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	6/18/1997	8:15	0.48	<	0.1		0.06		0.03		30				20		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	8/27/1997	9:00	1	<	0.1		0.06		0.03		10				64		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	10/15/1997	15:35	0.6	<	0.1		0.03		0.01	<	10			<	10		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	12/10/1997	8:10	0.26	<	0.1		0.01		0.01	<	10				10		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	4/22/1998	8:30	0.61	<	0.1		0.27		0.07		180				659		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	8/27/1998	9:15	0.66	<	0.1		0.08		0.06	<	10				10		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	10/27/1998	9:30	0.33	<	0.04		0.07		1	<	10				10		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	12/9/1998	9:00	0.71	<	0.1		0.04		0	<	1			<	1		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	2/24/1999	9:45	0.49	<	0.1		0.07		0.02	<	10			<	10		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	4/21/1999	8:55	0.73	<	0.1		0.17		0.04		70				31		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	6/9/1999	8:30	0.53	<	0.1		0.08		0.03		40				20		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	8/24/1999	17:15	0.38	<	0.1		0.05		0.01			<	10		20		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	10/27/1999	8:30	0.45	<	0.1		0.03		0				30	<	10		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	12/15/1999	9:20	0.61	<	0.1		0.03		0.01				30		30		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	2/23/2000	8:40	0.61	<	0.1		0.05		0			<	10	<	10		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	4/26/2000	10:00	0.2	<	0.1		0.06		0			<	10		10		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	6/7/2000	8:50	0.32	<	0.1		0.05		0.02			<	10	<	10		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	8/23/2000	10:10	0.38	<	0.1		0.07		0.03				10		20		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	10/17/2000	9:20	0.36	<	0.1		0.03		0			<	10	<	10		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	12/13/2000	8:50	0.22	<	0.1		0.02		0			<	10	<	10		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	2/21/2001	8:55	1.55	<	0.1		1.07		0.27				10		31		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	4/18/2001	10:00	0.39	<	0.1		0.06		0.01				10	<	10		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	6/26/2001	8:30	0.34	<	0.1		0.01		0				10		42		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	8/28/2001	10:25	0.3	<	0.1		0.02		0				30		10		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	10/23/2001	8:50	0.24	<	0.1		0.02		0				20	<	10		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	12/19/2001	9:10	0.21	<	0.1		0.02	E	0			<	10	<	10		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	2/13/2002	8:45	0.25	<	0.1		0.02	E	0				30	<	10		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	4/17/2002	9:30	0.47	<	0.1		0.04	E	0			<	10	<	10		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	8/21/2002	9:30	0.45	<	0.1		0.01	E	0			<	10		10		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	10/22/2002	9:35	0.2	<	0.1	E	0	E	0				10	<	10		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	12/11/2002	8:50	0.22	<	0.1		0.01	E	0			<	10	<	10		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	3/19/2003	8:40	0.4	<	0.1		0.02	E	0			<	10	<	10		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	5/14/2003	8:35	0.4	<	0.1		0.07	E	0				20		20		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	7/30/2003	8:25	0.3	<	0.1	E	0	E	0				40		42		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	9/10/2003	8:40	0.2	<	0.1	E	0	E	0			<	10	<	10		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	11/18/2003	9:00	0.2	<	0.1	E	0	E	0			<	10	<	10		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	4/14/2004	8:55	0.5	<	0.1		0.03	<	0.01			<	10	<	10		

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STATION NAME	STATION ID	STORET ID NEW	STORET ID LEGACY	DATE	TIME	Q Sb	Sb µg/L	Q As	As µg/L	Q Ba	Ba µg/L	Q Be	Be µg/L	Q B	B µg/L	Q Cd	Cd µg/L	Q Cr	Cr µg/L	Q Cu	Cu µg/L	Q F	F µg/L	Q Fe	Fe µg/L	Q Pb	Pb µg/L	Q Mn	Mn µg/L	Q Hg	Hg µg/L	Q Mo	Mo µg/L
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	8/30/1994	12:10				10						100	<	1	<	5		10				30		10			<	0.5		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	2/23/1995	9:00				4						100	<	1	<	5		10				60	<	5			<	0.5		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	8/15/1995	15:45				4						100	<	1	<	5	<	5				40	<	5			<	0.5		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	8/28/1996	8:30				7						100	<	1	<	5		10				20	<	5			<	0.5		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	2/26/1997	9:50				7						100	<	1	<	5		20				1500		8			<	0.5		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	8/27/1997	9:00				4						85	<	1	<	2	<	2				85	<	0.9			<	0.1		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	4/22/1998	8:30				6						85	<	1	<	2		4				3430		4				0.2		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	8/27/1998	9:15				7						94		2		3	<	2				54		0.9			<	0.1		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	2/24/1999	9:45				4						100	<	1	<	5	<	20				520	<	5			<	0.5		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	8/24/1999	17:15				10						100	<	1	<	5	<	20				30	<	5			<	0.5		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	2/23/2000	8:40				7						100	<	1	<	1	<	20				200	<	2			<	0.5		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	8/23/2000	10:10				14						100	<	1	<	2	<	20				70	<	2			<	0.5		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	2/21/2001	8:55				14						100	<	1		11		20				13800		10			<	0.5		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	8/28/2001	10:25				7						100	<	1	<	2		10				40	<	2			<	0.5		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	2/13/2002	8:45				8						200	<	1	<	2	<	20				80	<	2			<	0.5		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	4/17/2002	9:30				4						100	<	2	<	2	<	20				300	<	2			<	0.5		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	8/21/2002	9:30				8						100	<	2	<	2	<	20			E	20	<	2			<	0.5		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	3/19/2003	8:40				4						100	<	2	<	2	<	20				60	<	2			<	0.5		
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	7/30/2003	8:25				6						100	<	2	<	2	<	20			E	30	<	2			<	0.5		

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C=CALCULATED VALUE
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E= ESTIMATE, VALUE LESS THAN THE STATE HEALTH LAB REPORTING LIMIT, TRACKED FROM DEC. 2001 ON

STATION NAME	STATION ID	STORET ID NEW	STORET ID LEGACY	DATE	TIME	Q Ni	Ni µg/L	Q Se	Se µg/L	Q Tl	Tl µg/L	Q Zn	Zn µg/L	Q Ca	Ca MG/L	Q Na	Na MG/L	Q Mg	Mg MG/L	SAR	Q HARDNESS	HARDNESS CaC03 MG/L
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	8/30/1994	12:10			<	1				10		58		34		12	1.1		194
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	2/23/1995	9:00			<	1				20		43		29		8	1.1		140
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	8/15/1995	15:45			<	1				10		39		18		7	0.7		126
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	8/28/1996	8:30			<	1			<	5		48		26		9	0.9		157
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	2/26/1997	9:50			<	1				30		46		37		10	1.3		156
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	8/27/1997	9:00				0.8				3		36.1		18.8		6.77	0.8		118
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	4/22/1998	8:30			<	0.6				18		35.9		25.4		7.91	1		122
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	8/27/1998	9:15			<	0.6				11		45		22.4		8.03	0.8		145
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	2/24/1999	9:45			<	4				20		39		27		8	1		130
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	8/24/1999	17:15			<	6				10		49		30		11	1		168
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	2/23/2000	8:40				2				10		42		27		8	1		138
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	8/23/2000	10:10			<	2				10		51		28		10	0.9		169
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	2/21/2001	8:55			<	2				60		52		28		14	0.9		188
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	8/28/2001	10:25				5				20		51		29		11	1		173
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	2/13/2002	8:45				3			E	10		63		35		12	1.1		207
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	4/17/2002	9:30			<	2			<	50		37		27		7	1.1		121
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	8/21/2002	9:30			<	2			E	10		56		32		12	1		189
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	3/19/2003	8:40			<	2			E	10		47		29		9	1		155
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	7/30/2003	8:25			<	2			<	50		64		32		13	1		213

NEVADA DIVISION OF ENVIRONMENTAL PROTECTION
BUREAU OF WATER QUALITY PLANNING
GRAB/SURFACE WATER SAMPLES
PROVISIONAL RECORDS

DISSOLVED METALS

C=CALCULATED VALUE
O=SAMPLED BUT ANALYSIS NOT PERFORMED

E= ESTIMATE, VALUE LESS THAN THE STATE HEALTH LAB REPORTING LIMIT, TRACKED FROM DEC. 2001 ON

STATION NAME	STATION ID	STORET ID NEW	STORET ID LEGACY	DATE	TIME	Q As F	As F µg/L	Q B F	B F µg/L	Q Cd F	Cd F µg/L	Q Cr F	Cr F µg/L	Q Cu F	Cu F µg/L	Q Fe F	Fe F µg/L	Q Pb F	Pb F µg/L	Q Hg F	Hg F µg/L	Q Ni F	Ni F µg/L	Q Se F	Se F µg/L	Q Ag F	Ag F µg/L	Q Zn F	Zn F µg/L
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	8/30/1994	12:10																								
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	2/23/1995	9:00																								
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	8/15/1995	15:45																								
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	8/28/1996	8:30																								
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	2/26/1997	9:50																								
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	8/27/1997	9:00																								
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	4/22/1998	8:30																								
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	8/27/1998	9:15																								
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	2/24/1999	9:45		6		100	<	1	<	5	<	20		80	<	5	<	0.5			<	2				40
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	8/24/1999	17:15		8		200	<	1	<	5	<	20		20	<	5	<	0.5			<	6				10
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	2/23/2000	8:40		7		100	<	1	<	1	<	20		60		3	<	0.5			<	2				70
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	8/23/2000	10:10		20		200	<	1	<	2	<	20		10	<	2	<	0.5			<	2				40
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	2/21/2001	8:55		8		100	<	1	<	5		10		3130	<	5	<	0.5			<	2				110
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	8/28/2001	10:25		8		100	<	1	<	2	<	20		10	<	2	<	0.5				3				10
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	2/13/2002	8:45		8		200	<	1	<	2	E	10	E	20		3	<	0.5			<	2				90
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	4/17/2002	9:30		4		100	<	2	<	2	<	20		100	<	2	<	0.5			<	2			E	30
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	8/21/2002	9:30		8		200	<	2	<	2	<	20	E	10	<	2	<	0.5			<	2				80
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	3/19/2003	8:40		4		200	<	2	<	2	<	20	E	30	<	2	<	0.5			<	2				90
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	7/30/2003	8:25		5		200	<	2	<	2	<	20	E	0	<	2	<	0.5			<	2				120

NEVADA DIVISION OF ENVIRONMENTAL PROTECTION
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GRAB/SURFACE WATER SAMPLES
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E= ESTIMATE, VALUE LESS THAN THE STATE HEALTH LAB REPORTING LIMIT, TRACKED FROM DEC. 2001 ON

STATION NAME	STATION ID	STORET ID NEW	STORET ID LEGACY	DATE	TIME	Q Ca F	Ca F MG/L	Q Na F	Na F MG/L	Q Mg F	Mg F MG/L	SAR F	Q HARDNESS F	HARDNESS F CaC03 MG/L	COMMENTS
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	8/30/1994	12:10										
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	2/23/1995	9:00										
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	8/15/1995	15:45										
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	8/28/1996	8:30										
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	2/26/1997	9:50										
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	8/27/1997	9:00										
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	4/22/1998	8:30										
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	8/27/1998	9:15										
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	2/24/1999	9:45		40		28		8	1.1		133	
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	8/24/1999	17:15		48		35		10	1.2		161	
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	2/23/2000	8:40		42		30		8	1.1		138	
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	8/23/2000	10:10		51		33		10	1.1		169	
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	2/21/2001	8:55		39		29		8	1.1		130	
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	8/28/2001	10:25		57		33		12	1		192	
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	2/13/2002	8:45		61		38		12	1.2		202	
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	4/17/2002	9:30		37		29		7	1.1		121	
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	8/21/2002	9:30		57		36		12	1.1		192	
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	3/19/2003	8:40		48		36		9	1.2		157	
S. Fork Humboldt Below Dixie Creek	HS3A	04-HUM-03-01	310089	7/30/2003	8:25		64		35		13	1		213	

APPENDIX B

Soil Resources

TABLE B-1
Soil Map Units Within Study Area
Emigrant Mine Project

Soil Map Unit	Dominant Soil Subgroup Name	Control Texture	Depth to Induration or Bedrock (Inches)	Profile Permeability Class	Surface Runoff Class
A	Xeric Haplargid	Clayey Skeletal	>60	Slow/Very slow	Very rapid
B	Lithic Xeric Haplargid	Clayey Skeletal	< 20	Slow	Rapid
C	Xeric Paleargid	Fine	>60	Very slow	Very rapid
D	Xeric Argidurid	Fine Loamy	40-60	Slow	Rapid to Very rapid
F	Lithic Xeric Haplocambid	Loamy	<20	Slow	Rapid
G	Xeric Calciargid	Fine	>60	Moderately slow	Rapid
H	Lithic Xeric Haplocambid	Loamy Skeletal	<20	Slow	Very rapid
I	Xeric Haplargid	Fine	>60	Moderately slow	Medium
J	Xeric Paleargid	Fine loamy	>60	Slow	Rapid
K	Xeric Haplargid	Clayey Skeletal	20-40	Slow	Medium to Rapid
L	Xeric Paleargid	Fine	>60	Slow	Medium to Rapid
M	Xeric Haplocambid	Fine Loamy	>60	Moderate	Slow to Medium
MC	Xeric Paleargid	Fine	> 60	Very slow	Very rapid
MD	Xeric Calciargid	Clayey Skeletal/Fine	> 60	Slow	Very rapid
ME	Xeric Calciargid	Clayey Skeletal/Fine	20-40	Slow	Rapid
MJ	RO and Lithic Xeric Haplargid	Clayey Skeletal/Loamy Skeletal	< 20	Very slow to slow	Very rapid
MK	Xeric Haplargid	Clayey Skeletal	40-60	Very slow to slow	Very rapid
ML	Xeric Haplargid	Clayey Skeletal/Fine	40-60	Very slow to slow	Very rapid
MM	Xeric Haplargid	Clayey Skeletal/Fine	20-40	Very slow to slow	Very rapid
MO	Xeric Haplargid	Clayey Skeletal	20-40	Very slow to slow	Very rapid
N	Xeric Haplodurid	Coarse Loamy	20-40	Slow	Medium
NA	Xeric Haplocalcid	Fine Loamy	20-40	Slow	Medium to Rapid
NB	Xeric Haplodurid	Coarse Loamy	20-40	Slow	Very rapid
O	Xeric Haplargid	Fine Loamy	>60	Moderately slow	Medium
P	Duric Xeric Paleargid	Fine	40-60	Very slow to slow	Very rapid
PA	Lithic Xeric Haplocalcid	Loamy Skeletal	10-20	Slow	Very Rapid
ROM	RO and Lithic Xeric Haplargid	Clayey Skeletal/Loamy Skeletal	< 20	Very slow to slow	Very rapid
ROS	RO and Lithic Xeric Haplcambid	Loamy	< 20	Slow	Very rapid
RB	Xeric Haplargid	Clayey Skeletal/Loamy Skeletal	40-60	Slow	Rapid to Very rapid
RC	Xeric Calciargid	Clayey Skeletal/Fine	40-60	Very slow to slow	Medium to Rapid
RD	Xeric Haplargid	Clayey Skeletal/Fine	40-60	Very slow to slow	Rapid to Very rapid

Source: Maxim 2004a.

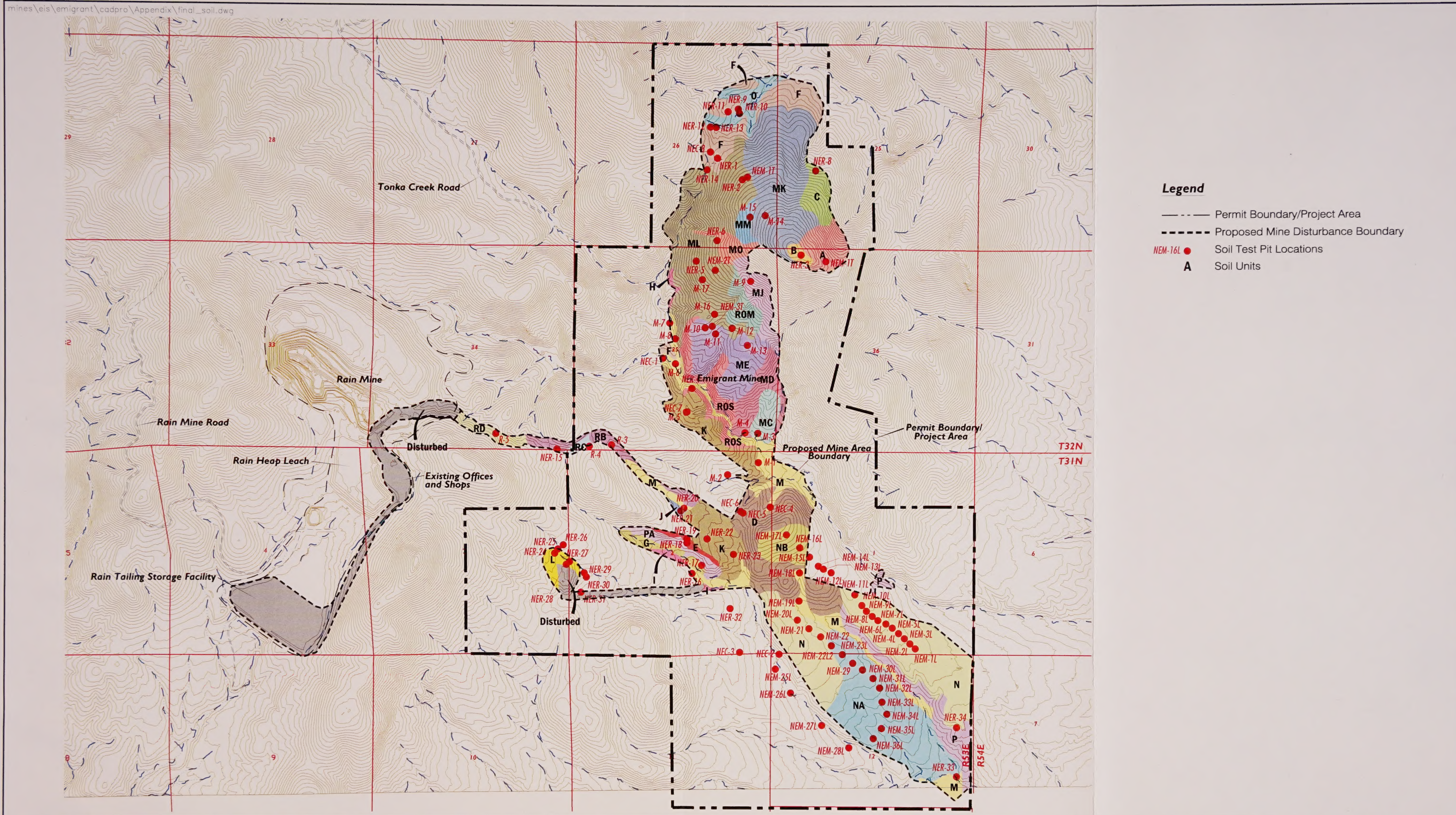
	Soil Subgroup	Salvage Suitability Class	Total Acreage	Percentage of Map Unit	Estimated Acreage	Salvage Depth (inches)	Cubic Yards Available
TABLE B-2 SOIL SALVAGE POTENTIAL EMIGRANT MINE PROJECT							
A Consociation	Xeric Haplargid and similar	NS	24.5	75	18.4	NA	
	RO			10	2.5	NA	
	Lithic Xeric Haplargid			10	2.5	NA	
	Xeric Haplocambid			5	1.2	NA	
				100	24.5	NA	0
B Association	Lithic Xeric Haplargid	NS	8.2	55	4.5	NA	
	Lithic Xeric Haplocambid			15	1.2	NA	
	Xeric Haplargid			15	1.2	NA	
	RO and Fragmental			15	1.2	NA	
				100	8.2	NA	0
C Consociation	Xeric Paleargid, or similar	Fair Clay% and C.F.	21	80	16.8	20	45,173
	Lithic Xeric Haplargid			15	3.2	6	2,541
	Rock outcrop			5	1.1	NA	NA
				100	21.0	NA	47,714
D Association	Xeric Haplargid, or similar	Fair-Poor Clay% and C.F.	108.5	45	48.8	20	131,285
	Lithic Xeric Haplocambid			20	21.7	6	17,505
	Lithic Xeric Haplargid or similar			20	21.7	6	17,505
	Xeric Argidurid, or similar			15	16.3	20	43,762
				100	108.5	NA	210,056
E Consociation	Xeric Haplocalcid or similar	Fair C.F.	4.5	70	3.2	24	10,164
	Xeric Calciargid or similar			20	0.9	24	2,904
	Lithic Xeric Haplocalcid			10	0.5	6	363
				100	4.5	NA	3,267
F Consociation	Lithic Xeric Haplocambid	Poor C.F. and depth	37	60	22.2	6	17,908
	Xeric Haplocambid			20	7.4	12	11,939
	Xeric Haplargid			10	3.7	12	5,969
	RO and Lithic Xeric Torriorthents			10	3.7	NA	NA
				100	37.0	NA	35,816
G Consociation	Xeric Calciargid	Fair Clay% and C.F.	10.6	90	9.5	30	38,478
	Xeric Haplargid or similar			5	0.5	30	2,138
	Lithic Xeric Haplargid or similar			5	0.5	10	713
				100	10.6	NA	41,328
H Association	Lithic Xeric Haplocambid	NS	6.3	50	3.2	NA	NA
	Xeric Haplocambid			30	1.9	NA	NA
	Xeric Haplargid			20	1.3	NA	NA
				100	6.3	NA	0
I Association	Xeric Haplargid/Xeric Paleargid	Good-Fair Clay% and C.F.	4.3	90	3.9	24	12,487
	Xeric Calciargid			5	0.2	30	867
	Xeric Haplodurid			5	0.2	24	694
				100	4.3	NA	14,048
J Consociation	Xeric Paleargid/Xeric Haplargid	Fair Clay% and C.F.	3.1	80	1.5	30	6,050
	Xeric Calciargid			15	0.5	30	1,876
	Lithic Xeric Haplargid or similar			5	0.2	12	250
				100	2.1	NA	8,176
K Association	Xeric Paleargid/Xeric Haplargid	Poor Clay, CF, Shallow	99.4	65	64.6	16	138,983
	Lithic Xeric Haplargids or similar			25	24.9	12	40,091
	RO and very shallow phases			10	9.9	NA	NA
				100	99.4	NA	179,075
L Association	Xeric Paleargid/Xeric Haplargid	Poor-FairClay, CF, and shallow	6.7	55	3.7	18	8,918
	Lithic Xeric Haplargids or similar			30	2.0	18	4,864
	Xeric Haplocambid			15	1.0	18	2,432
				100	6.7	NA	16,214

	Soil Subgroup	Salvage Suitability Class	Total Acreage	Percentage of Map Unit	Estimated Acreage	Salvage Depth (inches)	Cubic Yards Available
M Association	Xeric Haplargid	Good Variable OM, clay% and CF	130	35	27.5	36	133,100
	Xeric Haplocambid			35	27.5	36	133,100
	Xeric Calciargid			15	15.0	36	72,600
	Calcic Paleargid			15	15.0	24	48,400
				100	85.0	NA	387,200
MC Consociation	Xeric Paleargid/Haplargid	Poor CF, slope and Clay	17	90	15.3	12	24,684
	Lithic soils			10	1.7	8	1,828
				100	17.0	NA	26,512
MD Consociation	Xeric Calciargid/Haplargid	Poor Shallow, Clay, and CF	34.3	55	18.9	12	30,436
	Disturbed			20	6.9	12	11,067
	Xeric Haplargids			15	5.1	12	8,301
	Lithic Xeric Haplargids			10	3.4	NA	NA
				100	34.3	NA	49,804
ME Consociation	Xeric Haplargid	Poor Shallow, Clay, and CF	60.7	60	36.4	12	58,758
	Lithic Xeric Haplargids			25	15.2	6	12,241
	Disturbed			15	9.1	6	7,345
				100	60.7	NA	78,343
MJ Consociation	Rock Outcrop and Lithic Xeric Haplargid	NS	23.6	75	17.7	NA	NA
	Xeric Haplargid			20	4.7	NA	NA
	Others			5	1.2	NA	NA
				100	23.6	NA	0
MK Consociation	Xeric Calciargid	Poor Shallow, Clay, Slopes and CF	112.6	80	90.1	12	145,329
	Rock Outcrop and Lithic Xeric Haplargid			10	11.3	NA	NA
	Disturbed			10	11.3	6	9,083
				100	112.6	NA	154,412
ML Association	Xeric Calciargid	Poor Shallow, Clay, slopes and CF	159.9	30	48.0	12	77,392
	Xeric Haplargid			30	48.0	12	77,392
	Lithic Xeric Haplocambid			10	16.0	NA	NA
	Lithic Xeric Haplargid			10	16.0	NA	NA
	Xeric Haplocambid			5	8.0	12	12,899
	Rock Outcrop			15	24.0	NA	NA
				100	159.9	NA	167,682
MM Consociation	Xeric Haplargid and similar	Poor Shallow, Clay and CF	9.6	90	8.6	16	18,586
	Lithic Xeric Haplargid and similar			5	0.5	NA	NA
	Rock Outcrop			5	0.5	NA	NA
				100	9.6	NA	18,586
MO Consociation	Xeric Haplargid	Poor Shallow, Clay and CF	13.5	80	10.8	20	29,040
	RO and very shallow soils			10	1.4	NA	NA
	Xeric Calciargid			10	1.4	20	3,630
					13.5	NA	32,670
N Complex	Xeric Haplodurid	Fair Hardpans, occasional CF	181.3	65	113.7	18	275,154
	Xeric Argidurid			25	44.4	24	143,264
	Xeric Calciargid			5	9.1	24	29,250
	Xeric Haplocalcid			5	9.1	24	29,250
				100	176.2	NA	476,917
NA Complex	Xeric Calciargid or similar	Fair Hardpans, occasional CF	274.1	50	66.7	24	215,219
	Xeric Haplocalcid			40	53.6	24	172,949
	Xeric Haplodurid			10	13.4	18	32,428
				100	133.7	NA	420,596
NB Consociation	Xeric Argidurid, or similar	Fair Hardpans, slopes, occasional CF	34	85	28.9	20	77,709
	Xeric Haplodurid, or similar			10	3.4	20	9,142
	Lithic Xeric Haplargids or similar			5	1.7	6	1,371
				100	34.0	NA	88,222

Map Unit	Soil Subgroup	Salvage Suitability Class	Total Acreage	Percentage of Map Unit	Estimated Acreage	Salvage Depth (inches)	Cubic Yards Available
O Consociation	Xeric Haplargid	Fair Isolated, occasional CF	12.7	85	10.8	32	46,442
	Xeric Haplocambid			10	1.3	20	3,415
	Lithic Xeric Haplocambid			5	0.6	6	512
				100	12.7	NA	50,370
P Association	Duric Xeric Paleargid, and similar	NS	69.7	40	17.4	24	56,144
	Xeric Calciargid and similar			20	8.6	24	27,749
	Lithic Xeric Haplocalcid			30	13.0	6	10,487
	Xeric Haplodurid			10	4.4	6	3,549
				100	43.4	NA	97,929
PA Complex	Lithic Xeric Haplocalcid	NS	14.7	65	9.6	NA	NA
	Xeric Calciargid and similar			20	2.9	NA	NA
	Xeric Haplocalcid			15	2.2	NA	NA
				100	14.7	NA	0
RB Complex	Xeric Haplargid	Fair Shallow, Clay and CF	23.7	60	14.2	12	22,942
	Xeric Calciargid			25	5.9	12	9,559
	Xeric Haplocambid			10	2.4	12	3,824
	Lithics			5	1.2	6	956
				100	23.7	NA	37,280
RC Consociation	Xeric Calciargid and similar	Fair Shallow, Clay and CF	3.4	80	2.7	12	4,388
	Xeric Haplocambid, and similar			20	0.7	12	1,097
				100	3.4	NA	42,765
RD Consociation	Xeric Haplargid	Poor Slopes, Clay and CF	13.2	80	10.6	8	11,358
	Xeric Haplocambid			15	2.0	8	2,130
	Lithics			5	0.7	6	532
				100	13.2	NA	2,662
ROM Association	Rock Outcrop	NS	18	55	9.9	NA	
	Xeric Haplargid and similar			25	4.5	NA	
	Lithic Xeric Haplocambid			15	2.7	NA	
	Lithic Xeric Haplargids			5	0.9	NA	
				100	18.0	NA	0
ROS Association	Rock Outcrop	NS	34.5	50	17.3	NA	
	Lithic Xeric Haplocambid			20	6.9	NA	
	Lithic Xeric Haplargids			20	6.9	NA	
	Xeric Calciargid and similar			10	3.5	NA	
				100	34.5	NA	0
Disturbed			45.2	100	45.2	NA	0
Totals			**1402**	**100**		**NA**	**2,687,645**

Notes:
Soil Salvage Class = Denotes class and prominent restrictive characteristic other than low organic matter content.
Soil Salvage Class = With the exception of Map units M and I, all map units generally have organic matter content less than three percent which keep the salvage suitability no greater than fair. In addition the percent organic matter content in salvaged soils from map units M and I will likely also be well below three percent unless only the top one foot is salvaged.
NS: Not salvageable except for occasional opportunistic salvage.
CF: Coarse fragments
NA: Not applicable
RO: Rock outcrop

Figure B-1 Soil Resources



Data Source: Maxim 2004a, 2004c

N

0 Feet 2400

Contour Interval = 20'

Soil Resources
Emigrant Mine Project
Elko County, Nevada
APPENDIX B-1

APPENDIX C

Vascular Plant Species in the Emigrant Project Area

Binomial	Code	Common Name
NATIVE PERENNIAL GRAMINOIDS		
Agrostis exarata	Agr exa	Spike bentgrass
Agrostis scabra	Agr sca	Rough bentgrass
Alopecurus aequalis	Alo aeq	Shortawn foxtail
Carex douglasii	Car dou	Douglas's sedge
Carex nebraskensis	Car neb	Nebraska sedge
Danthonia unispicata	Dan uni	One-spike oatgrass
Deschampsia elongata	Des elo	Slender hairgrass
Distichlis spicata - (Distichlis stricta)	Dis spi	Alkali saltgrass
Eleocharis palustris	Ele pal	Common spikesedge
Elymus elymoides - (Sitanion hystrix)	Ely ely	Bottlebrush squirreltail
*Elymus lanceolatus*** - (Agropyron dasystachyum)*	Ely lan	Thickspike wheatgrass
Elymus trachycaulus - (Agropyron trachycaulum)	Ely tra	Slender wheatgrass
Festuca idahoensis	Fes ida	Idaho fescue
Hordeum brachyantherum	Hor bra	Meadow barley
Hordeum jubatum	Hor jub	Foxtail barley
Juncus balticus	Jun bal	Baltic rush
Juncus ensifolius	Jun ens	Dagger-leaf rush
Juncus longistylis	Jun lon	Longstyle rush
Leymus cinereus - (Elymus cinereus)	Ley cin	Basin wildrye
Leymus triticoides - (Elymus triticoides)	Ley tri	Creeping wildrye
Melica bulbosa	Mel bul	Oniongrass
*Nassella viridula** - (Stipa viridula)*	Nas vir	Green needlegrass
Oryzopsis hymenoides	Ory hym	Indian ricegrass
Pascopyrum smithii - (Agropyron smithii)	Pas smi	Western wheatgrass
Poa secunda var. nevadensis - (Poa nevadensis)	Poa nev	Nevada bluegrass
Poa secunda var. secunda - (Poa sandbergii)	Poa sec	Sandberg's bluegrass
Pseudelymus x saxicola - (Agrositanion saxicola)	Pse sax	Rock wheatgrass
Pseudoroegneria spicata - (Agropyron spicatum)	Pse spi	Bluebunch wheatgrass
*Scirpus americanus**	Sci ame	American bulrush
Scirpus microcarpus	Sci mic	Panicled bulrush
Stipa comata	Sti com	Needle-and-thread
Stipa lettermanii	Sti let	Letterman's needlegrass
Stipa thurberiana	Sti thu	Thurber needlegrass
INTRODUCED PERENNIAL GRAMINOIDS		
*Agropyron cristatum***	Agr cri	Crested wheatgrass
Agropyron desertorum - (Agropyron cristatum)	Agr des	Desert wheatgrass
Agrostis stolonifera	Agr sto	Redtop
Elytrigia elongata - (Agropyron elongatum)*	Ely elo	Tall wheatgrass
Elytrigia intermedia - (Agropyron intermedium)	Ely int	Intermediate wheatgrass
Poa bulbosa	Poa bul	Bulbous bluegrass
Poa compressa	Poa com	Canada bluegrass
Poa palustris	Poa pal	Fowl bluegrass
Poa pratensis	Poa pra	Kentucky bluegrass
NATIVE ANNUAL GRAMINOIDS		
Deschampsia danthonioides	Des dan	Annual hairgrass
Juncus bufonius	Jun buf	Toad rush
*Muhlenbergia minutissima**	Muh min	Annual muhly
*Poa annua**	Poa ann	Annual bluegrass
INTRODUCED ANNUAL GRAMINOIDS		
*Apera interrupta**	Ape int	Italian windgrass
Bromus tectorum	Bro tec	Cheatgrass brome
Polypogon monspeliensis	Pol mon	Rabbitfoot polypogon
Vulpia sp.	Vul sp.	Annual fescue species

Binomial	Code	Common Name
NATIVE PERENNIAL FORBS		
Achillea millefolium	Ach mil	Common yarrow
*Agastache urticifolia**	Aga urt	Nettle-leaf giant-hyssop
*Agoseris glauca***	Ago gla	Pale agoseris
*Allium hookeri***	All ???	entity unknown
Allium sp.	All sp.	Onion species
Antennaria dimorpha	Ant dim	Low pussytoes
Arabis cobrensis	Ara cob	Gray rockcress
*Argemone munita**	Arg mun	Armed prickly-poppy
Artemisia ludoviciana	Art lud	Cudweed sagewort
Asclepias speciosa	Asc spe	Showy milkweed
Aster ascendens - (Aster chilensis)	Ast asc	Long-leaved aster
Aster occidentalis	Ast occ	Western aster
Astragalus lentiginosus (var. chartaceus?)	Ast len	Freckled milkvetch
Astragalus newberryi	Ast new	Newberry milkvetch
Astragalus purshii	Ast pur	Pursh's milkvetch
Balsamorhiza hookeri	Bal hoo	Hooker balsamroot
Balsamorhiza sagittata	Bal sag	Arrowleaf balsamroot
Caulanthus crassicaulis	Cau cra	Thickstem wildcabbage
*Chaenactis douglasii**	Cha dou	Douglas chaenactis
Crepis acuminate	Cre acu	Tapertip hawksbeard
Crepis occidentalis	Cre occ	Western hawksbeard
Cryptantha spiculifera	Cry spi	Pointed cryptantha
Cusickiella douglasii - (Draba douglasii)	Cus dou	Douglas draba
Cymopterus sp.	Cym sp.	Spring-parsley species
*Epilobium angustifolium**	Epi ang	Fireweed
Epilobium ciliatum	Epi cil	Common willow-herb
Erigeron sp - (bloomeri/linearis?)	Eri sp.	Fleabane species
Eriogonum caespitosum	Eri cae	Mat buckwheat
Eriogonum heracleoides	Eri her	Parsnip-flower buckwheat
Eriogonum umbellatum var. umbellatum	Eri umb	Sulfur buckwheat
Eriophyllum lanatum	Eri lan	Woolly yellow daisy
Glycyrrhiza lepidota	Gly lep	American licorice
Hackelia sp.	Hac sp.	Stickseed species
*Hypericum anagalloides**	Hyp ana	Creeping St. John's-wort
Hypericum scouleri - (Hypericum formosum)	Hyp sco	Western St. John's-wort
Ionactis alpine - (Aster scopulorum)	Ion alp	Crag aster
Iva axillaries	Iva axi	Poverty weed
Ivesia baileyi var. beneolens	Ive bai	Bailey ivesia
Lemna sp.	Lem sp.	Duckweed species
*Linum lewisii***	Lin lew	Blue flax
Lithospermum ruderale	Lit rud	Western gromwell
*Lomatium dissectum***	Lom dis	Fern-leaved lomatium
Lomatium macrocarpum	Lom mac	Large-fruited lomatium
Lomatium nudicaule	Lom nud	Barestem lomatium
Lupinus caudatus	Lup cau	Spurred lupine
Mentha arvensis	Men arv	Field mint
Mimulus guttatus	Mim gut	Common monkey-flower
Monardella odoratissima ssp. glauca	Mon odo	Mountain horsemint
Opuntia erinacea	Opu eri	Mojave pricklypear
*Orobanche corymbosa**	Oro cor	Flat-topped broomrape
Pediocactus simpsonii var. simpsonii	Ped sim	Hedgehog cactus
Penstemon humilis ssp. humilis	Pen hum	Low penstemon
Penstemon speciosus	Pen spe	Royal penstemon

Binomial	Code	Common Name
NATIVE PERENNIAL FORBS (continued)		
Petradoria pumila ssp. pumila	Pet pum	Rock goldenrod
Petrophyton caespitosum	Pet cae	Rocky Mountain rockmat
Phacelia hastata	Pha has	Silverleaf phacelia
Phlox diffusa	Phl dif	Spreading phlox
Phlox hoodii	Phl hoo	Hood's phlox
Phlox longifolia	Phl lon	Long-leaf phlox
Phlox stansburyi	Phl sta	Stansbury phlox
Phoenicaulis cheiranthoides	Pho che	Daggerpod
Physaria chambersii	Phy cha	Chamber twinpod
Ranunculus cymbalaria	Ran cym	Rocky Mountain buttercup
*Scutellaria antirrhinoides**	Scu ant	Snapdragon skullcap
Senecio integerrimus	Sen int	Western groundsel
Sidalcea oregana var. nevadensis	Sid ore	Oregon checkermallow
Stenotus acaulis - (Haplopappus acaulis)	Ste aca	Cushion goldenweed
Stephanomeria spinosa - (Lygodesmia spinosa)	Ste spi	Thorny skeletonplant
Trifolium wormskioldii	Tri wor	Cow clover
Typha latifolia	Typ lat	Common cattail
*Urtica dioica**	Urt dio	Stinging nettle
Veronica Americana	Ver ame	American speedwell
*Viola purpurea**	Vio pur	Goosefoot violet
*Zigadenus paniculatus***	Zig pan	Foothill death-camas
INTRODUCED PERENNIAL FORBS		
*Cardaria draba**	Car dra	Heart-podded hoarycress
Kochia prostrata	Koc pro	Prostrate summer-cypress
Plantago major	Pla maj	Common plantain
Rorippa nasturtium-aquaticum - (Nasturtium officinale)	Ror nas	Water-cress
Rumex crispus	Rum cri	Curl dock
*Sanguisorba minor***	San min	Garden burnet
Taraxacum officinale	Tar off	Common dandelion
Veronica anagallis-aquatica	Ver ana	Water speedwell
NATIVE ANNUAL/BIENNIAL FORBS		
*Amaranthus sp.**	Ama sp.	Pigweed species
Amsinckia intermedia	Ams int	Fireweed fiddleneck
*Amsinckia tessellata***	Ams tes	Western fiddleneck
Arabis holboellii	Ara hol	Holboell's rockcress
Brachyactis frondosa - (Aster frondosus)	Bra fro	Alkali aster
Chamaesyce serpyllifolia - (Euphorbia serpyllifolia)	Cha ser	Thyme-leaf spurge
Cirsium neomexicanum var. utahense	Cir neo	Intermountain thistle
*Cirsium scariosum**	Cir sca	Elk thistle
*Collinsia parviflora**	Col par	Blue-eyed Mary
*Collomia linearis**	Col lin	Narrow-leaf collomia
*Conyza canadensis**	Con can	Canada horseweed
*Cryptantha fendleri**	Cry fen	Fendler's cryptantha
Cryptantha sp.	Cry sp.	Cryptantha species
*Descurainia pinnata***	Des pin	Pinnate tansymustard
Epilobium brachycarpum - (Epilobium paniculatum)	Epi bra	Autumn willow-herb
*Gayophytum ramosissimum***	Gay ram	Hairstem groundsmoke
Gilia aggregata var. aggregata	Gil agg	Scarlet gilia
Gnaphalium palustre	Gna pal	Lowland cudweed
Lappula occidentalis - (Lappula redowskii)	Lap occ	Western stickseed
Lepidium densiflorum	Lep den	Prairie pepperweed
Machaeranthera canescens	Mac can	Hoary aster
Madia glomerata	*Mad glo*	*Cluster tarweed*
*Navarretia breweri**	*Nav bre*	*Yellow navarretia*

Binomial	Code	Common Name
NATIVE ANNUAL/BIENNIAL FORBS (Continued)		
Navarretia intertexta var. propinqua	*Nav int*	*Great Basin navarretia*
*Nicotiana attenuata**	*Nic att*	*Coyote tobacco*
*Plagiobothrys scouleri**	*Pla sco*	*Scouler's popcorn-flower*
Polygonum aviculare	*Pol avi*	*Prostrate knotweed*
Polygonum polygaloides var. confertiflorum	*Pol pol*	*Polygala knotweed*
Ranunculus sceleratus	*Ran sce*	*Celery-leaved buttercup*
*Trifolium cyathiferum**	*Tri cya*	*Cup clover*
Trifolium variegatum	*Tri var*	*White-tip clover*
INTRODUCED ANNUAL/BIENNIAL FORBS		
Alyssum desertorum	Aly des	Desert alyssum
Ceratocephala testiculata - (Ranunculus testiculatus)	Cer tes	Bur buttercup
*Chorispora tenella**	Cho ten	Blue mustard
Cirsium vulgare	Cir vul	Bull thistle
Descurainia Sophia	Des sop	Flixweed tansymustard
Erodium cicutarium	Ero cic	Alfilaria
*Gnaphalium uliginosum**	Gna uli	Marsh cudweed
*Halogeton glomeratus**	Hal glo	Halogeton
Lactuca serriola	Lac ser	Prickly lettuce
Lepidium perfoliatum	Lep per	Clasping pepperweed
*Melilotus officinalis***	Mel off	Yellow sweetclover
Onopordum acanthium	Ono aca	Scotch thistle
Sisymbrium altissimum	Sis alt	Tumblemustard
*Thlaspi arvense**	Thl arv	Fanweed
Tragopogon dubius	Tra dub	Common salsify
*Verbascum thapsus**	Ver tha	Flannel mullein
SHRUBS		
Amelanchier alnifolia	Ame aln	Western serviceberry
Amelanchier utahensis	Ame uta	Utah serviceberry
Artemisia arbuscula	Art arb	Low sagebrush
Artemisia tridentata ssp. tridentata	Art tri	Basin big sagebrush
Artemisia tridentata ssp. vaseyana	Art vas	Mountain big sagebrush
*Artemisia tridentata ssp. wyomingensis***	Art wyo	Wyoming big sagebrush
Atriplex canescens	Atr can	Four-wing saltbush
Brickellia microphylla var. microphylla	Bri mic	Littleleaf brickellbush
Cercocarpus ledifolius	Cer led	Curly-leaf mountain mahogany
Chrysothamnus nauseosus ssp. albicaulis	Chr nau alb	Rubber rabbitbrush
Chrysothamnus nauseosus ssp. consimilis	Chr nau con	Rubber rabbitbrush
Chrysothamnus viscidiflorus ssp. puberulus	Chr vis pub	Green rabbitbrush
Chrysothamnus viscidiflorus ssp. viscidiflorus	Chr vis vis	Green rabbitbrush
Eriogonum microthecum var. laxiflorum	Eri mic	Slenderbush buckwheat
Holodiscus dumosus	Hol dum	Bush oceanspray
Leptodactylon pungens	Lep pun	Prickly phlox
*Porophyllum gracile**	Por gra	Slender poreleaf
Prunus virginiana	Pru vir	Common chokecherry
Purshia mexicana - (Cowania mexicana)	Pur mex	Mexican cliffrose
Purshia tridentata	Pur tri	Antelope bitterbrush
Ribes aureum	Rib aur	Golden currant
Ribes cereum	Rib cer	Wax currant
*Ribes cuneum**	Rib ???	entity unknown
*Rosa woodsii**	Ros woo	Wood's rose
Salix exigua	Sal exi	Sandbar willow
Salix laevigata	Sal lae	Polished willow
*Sambucus mexicana**	Sam mex	Mexican elderberry
Tetradymia canescens	Tet can	Gray horsebrush
Tetradymia glabrata	Tet gla	LIttleleaf horsebrush

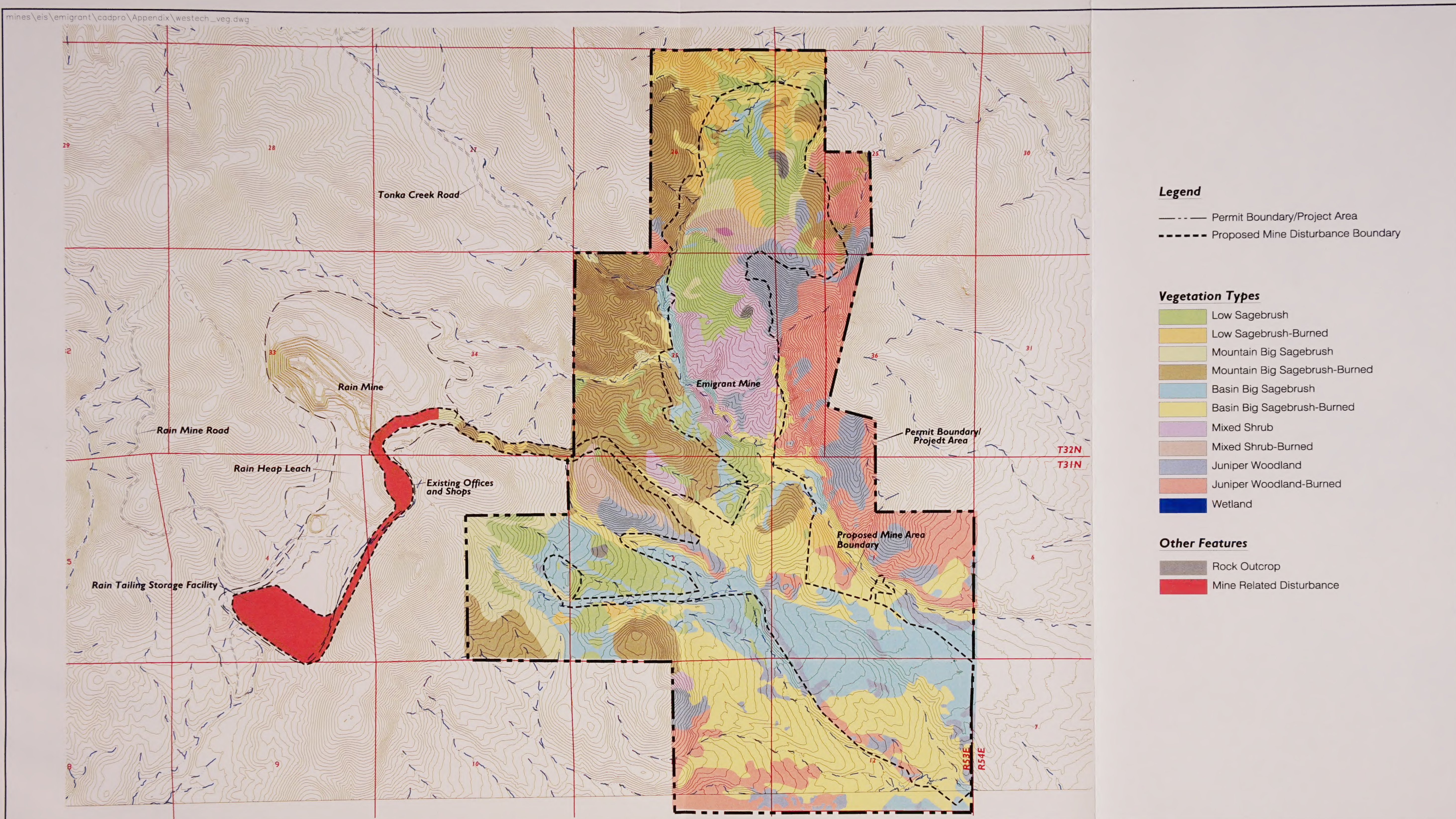
Binomial	Code	Common Name
TREES		
*Juniperus monosperma***	Jun mon	One-seed juniper
Juniperus osteosperma	Jun ost	Utah juniper
Pinus monophylla	Pin mon	Singleleaf pinyon
Populus tremuloides	Pop tre	Quaking aspen

Nomenclature follows Kartesz (1994). Parenthetical synonyms are from Cronquist et al. (1977-1997).

* indicates species identified by EIP Associates (1997) that were not recorded during the present (WESTECH 2004) inventory

** indicates species identified by Cedar Creek Associates (1997) that were not recorded during the present (WESTECH 2004) inventory

*** indicates a combination of the above.



Vegetation Data Source: Westech 2004a.

N

0 Feet 2400

Contour Interval = 20'

Vegetation Resources
Emigrant Mine Project
Elko County, Nevada
APPENDIX C-1

APPENDIX D

Summary of Management Documents Associated with Aquatic Resources

Elko BLM Resource Management Plan (RMP)

Dixie Creek (a terminus of the unnamed tributary originating at Emigrant Spring) has been identified in the Elko RMP as containing 2.5 miles of high priority stream in need of riparian and stream habitat improvement. The RMP Record of Decision (ROD) ROD directs BLM to manage these areas to "provide good habitat conditions for wildlife and fish".

Dixie Creek Watershed Analysis and Plan

Objectives described in this document for the Dixie Creek watershed include:

- Maintain or improve the herbaceous component of existing ground cover using watershed cover data obtained in conjunction with existing range and wildlife monitoring studies;

- Re-establish the riparian zone along 12 miles of Dixie Creek;

- Improve the overall aquatic/riparian habitat condition from 33 percent of optimum to 45 percent of optimum in the short term and to a good condition rating during the 20-year planning period of the Elko RMP;

- Decrease the sediment yield into the South Fork of the Humboldt River by 25 percent within the first 10 years and 50 percent during the 20-year planning period for the Elko RMP; and

- Extend perennial flow to the South Fork of the Humboldt River from its present point of subsurface entry within the 20-year planning period of the Elko RMP.

Recovery Plan for the Lahontan Cutthroat Trout

The Endangered Species Act requires a formal recovery plan for listed species. In 1995, the federal recovery plan for Lahontan cutthroat trout was completed by the U.S. Fish and Wildlife Service (USFWS 1995) and is scheduled for revision by 2007 to incorporate genetic, population, viability analysis, and other research. This recovery plan did identify Dixie Creek as supporting a "population best suited for recovery".

The recovery plan calls for the following actions:

- Identify and coordinate interagency activities to secure, manage, and improve habitat for all existing populations of Lahontan cutthroat trout;

- Revise the Lahontan cutthroat plan based on genetic population viability and other research;

- Develop and implement Lahontan cutthroat trout reintroduction plans;

- Regulate Lahontan cutthroat trout harvest to maintain viable populations; and,

- Manage self-sustaining Lahontan cutthroat trout populations existing out of native range until their need is completed.

South Fork Humboldt River Interdisciplinary Management Plan

This document describes goals for management of the sport fishery in the South Fork of the Humboldt River (SFHR). Important goals are:

- Adoption of a "Wild Fishery Management Concept" for the SFHR with emphasis on brown trout, smallmouth bass, and channel catfish (cutthroat trout use of the river is nonexistent or incidental);
- Improvements in water quality and aquatic and riparian habitat; and,
- Prevent nonnative salmonids from accessing the native cutthroat trout population in Dixie Creek.

Agreement for Management of the El Jiggs (Dixie Creek) Allotment

This document establishes a grazing plan and management goals for the upper reaches of Dixie Creek

Biological Assessment and Biological Opinion for the El Jiggs (Dixie Creek) Allotment

These documents address grazing management in the upper reaches of Dixie Creek, and they establish Dixie Creek's importance in terms of Lahontan cutthroat trout.

Nevada BLM's Riparian Demonstration Area

In 1990, lower Dixie Creek was selected as Nevada BLM's Riparian Demonstration Area. Designation of lower Dixie Creek (including the area potentially impacted by the Emigrant Project), as a statewide demonstration area for habitat restoration shows its importance in terms of riparian values and recovery habitat for Lahontan cutthroat trout.

APPENDIX E

Summary of Sediment Yield Model

APPENDIX E

SEDIMENT YIELD ESTIMATE
WATER EROSION PREDICTION PROJECT (WEPP) MODEL
EMIGRANT MINE PROJECT
NEVADA

Potential sediment yield from slopes associated with the Emigrant Project were estimated using the Water Erosion Prediction Project (WEPP) model. The model predicts sediment yield from hill slopes based on site physical parameters including soil type, slope configuration and grade, precipitation, and vegetation. Estimates of sediment yield were made for three scenarios of interest: 1) existing conditions or pre-mining, (2) during mining when disturbed slopes have been topsoiled but before vegetation has become established, and 3) following successful establishment of vegetation on reclaimed slopes. Descriptions for input parameters (soil type, slope configuration and grade, precipitation, and vegetation) for various modeled scenarios are described below. Results are presented following the input parameters.

INPUT PARAMETERS

<u>Soil Type</u>. Various soil types are present within the area to be disturbed during mining. The WEPP model has a built-in database of soil series which the model uses to estimate sediment yield. Three soil series were selected for input to the model based on similar chemical and physical characteristics to soil families mapped during the Order II soil survey conducted on the proposed mine site (Maxim, 2004) and the Soil Survey of Elko County Nevada, Central Part (USDA, 1986). These soil series are the primary soil types encountered within the proposed disturbance area and available in WEPP's soil database. The soil series used are the Vanwyper, Hopeka, and Linkup. We assume that the WEPP model uses these as if they were in their in-situ condition. For scenarios relating to existing slopes this may be the case. However, following stripping, stockpiling and subsequent spreading of topsoil, these soil series will have been mixed and various horizons within the soil types will have been mixed. Whether or not they yield sediment in a manner similar to in-situ soil is uncertain. Consequently, we have assumed that the mixed soil placed during reclamation would yield sediment similar to what the soil would yield in the in-situ condition (with all other factors being the same).

<u>Slope Configuration and Grade</u>. The proposed mine disturbance area consists of complex land forms with a wide range of slope configurations and slope lengths. To represent pre-mining conditions we selected and modeled three slope configurations. These all consist of uniform grade slopes with variable lengths of 500, 1,000 and 1,500 feet. These lengths were selected based on examination of aerial photographs and topographic maps of the proposed disturbance area. On these various slope lengths we imposed grades of 15%, 20% and 25% and modeled the resulting sediment yield. These combinations of slope and slope lengths are intended to be a 'worst case' scenario estimate of the sediment yield.

To represent conditions that might exist during mining and after mining, we created three additional models to represent a heap leach pad, a reclaimed waste rock dump and a road cut or fill slope. The heap leach model consists of an upper slope with a length of 1,500 feet at a 3% grade that terminates in a 2.5:1 slope with a length of 600 feet. The waste rock dump consists

of a single slope of 2.5:1 (H:V) with a length of 600 feet. The road slope consists of a 300 feet long slope also with a grade of 2.5:1. In practice, road slopes will be variable in length and grade depending on the sideslope on which it is built and other factors. The 300-foot long, 2.5:1 slope we used likely represents the 'worst case' scenario.

Precipitation. The WEPP model uses a built-in database of precipitation information. Weather data from the Elko Weather Service Office was used in the modeling scenarios. The WEPP model uses this data and extracts several statistical parameters from the historical data. The model creates a synthetic record of precipitation events that might occur over the duration of a user-selected modeling period. A modeling period of 100 years was selected to encompass more extreme events in the modeling period. Extreme events generally produce the largest volume of sediment yield. Sediment yield during dry weather or during less intense precipitation events is generally negligible.

Vegetation Type. Vegetation cover has a strong influence on sediment yield. The WEPP model contains a database of vegetation types used to determine the influence of vegetation on sediment yield. The model also simulates the variation of vegetation within the model period due to seasonality, response of vegetation to drought, and response to fire. Different vegetation types and vegetation management scenarios were selected to represent the current condition as well as conditions during the mining/reclamation period. Specifically, 'Mountain Sagebrush' with grazing and burning' was selected to represent pre-mining conditions and 'Wheatgrass-Needlegrass' was selected to represent conditions that would occur following successful reclamation. In addition, an intermediate condition exists between current site conditions and successful reclamation. This condition occurs when slopes (on heap leaches, waste rock dumps and roads have been topsoiled but vegetation has not yet been established. The slopes are essentially bare and then gradually more vegetative cover and root mass becomes established until successful reclamation is reached. To simulate this intermediate condition, a vegetation management type from the WEPP model called 'falllow' was used. Fallow is an agricultural term meaning a field that is continually plowed to purposely prevent vegetation from growing. While the specific condition being modeled is not continually fallowed, the bare soil that exists just after topsoiling but before establishment of vegetation is similar to a fallowed field.

MODEL RESULTS

Existing Conditions. Based on the various combinations of model data described above, 27 different scenarios (3 soil series, times 3 slope lengths, times 3 slope grades, times 1 precipitation series, times 1 vegetation type) were created to simulate sediment yield from existing conditions. **Table E-1** below summarizes estimated sediment yield for each of these scenarios. The estimated sediment yield from these scenarios ranges from 0.021 to 0.178 tons/acre/year.

During Mining. Scenarios created to estimate soil losses during mining simulate slopes with various configurations to simulate a heap leach pad, waste rock dump and road slopes which have been topsoiled but on which vegetation has not yet established itself (bare soil). **Table E-2** below summarizes estimated sediment yield for each scenario modeled. The expected range of sediment yield for the heap leach pad ranges from 14.9 to 34.8 tons/acre/year, 35.4 to 66.6 tons/acre/year for the waste rock disposal site, and 22.7 to 41.6 tons/acre/year for road slopes.

TABLE E-1 Estimated Sediment Yield from Pre-Mining Scenarios			
Soil Series	**Slope Length (ft)**	**Grade (%)**	**Mean Annual Sediment Yield (tons/acre/year)**
VanWyper	500	15	0.021
		20	0.035
		25	0.051
	1000	15	0.021
		20	0.046
		25	0.077
	1500	15	0.021
		20	0.041
		25	0.066
Linkup	500	15	0.027
		20	0.058
		25	0.108
	1000	15	0.033
		20	0.084
		25	0.137
	1500	15	0.031
		20	0.072
		25	0.122
Hopeka	500	15	0.035
		20	0.079
		25	0.137
	1000	15	0.046
		20	0.101
		25	0.178
	1500	15	0.04
		20	0.096
		25	0.188

TABLE E-2 Estimated Sediment Yield During Mining		
Facility	**Soil Series**	**Estimated Mean Annual Sediment Yield (tons/acre/year)**
Heap Leach Pad	Van Wyper	19.6
	Linkup	14.9
	Hopeka	34.8
Waste Rock Dump	Van Wyper	37.6
	Linkup	35.4
	Hopeka	66.6
Road Slopes	Van Wyper	22.7
	Linkup	23.8
	Hopeka	41.6

Post-Reclamation. Scenarios created to estimate sediment yield included slope configurations that included reclaimed heap leach pad, waste rock dump, and road slopes. The scenarios differed from those described above for 'During Mining' in that they included a 'Wheatgrass-Needlegrass' cover. **Table E-3** below summarizes estimated sediment yield for scenarios modeled. Sediment yield for a reclaimed heap leach ranges from 0.1 to 0.7 tons/acre/year, 0.8 to 3.0 tons/acre/year for the reclaimed waste rock disposal site, and 0.5 to 1.5 tons/acre/year for reclaimed road slopes.

TABLE E-3
Estimated Sediment Yield Following Reclamation

Facility	Soil Series	Estimated Mean Annual Sediment Yield (tons/acre/year)
Heap Leach Pad	Van Wyper	.1
	Linkup	.2
	Hopeka	.7
Waste Rock Dump	Van Wyper	.8
	Linkup	1.4
	Hopeka	3.0
Road Slopes	Van Wyper	0.5
	Linkup	0.7
	Hopeka	1.5

It should be noted that mean annual sediment yield predicted by the WEPP model is that sediment volume that may occur at the toe of slopes within the area of proposed disturbance. It is not the volume of sediment that can be expected to occur at a particular point in a stream or channel within the area of interest. Transport capacity of channels, flow velocity in channels, deposition within channels, and other factors influence the portion of the hill slope sediment yield that may be transported to a particular point in a stream or channel or would be collected in a sediment pond or trap.